

Influences of Disabling Conditions on the Nature And Frequency of Farm/ranch-related Injuries

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Abstract

Agricultural production remains one of the most hazardous occupations in the United States. With an estimated 780 work-related fatalities and 140,000 non-fatal workplace injuries (National Safety Council, 1999), those engaged in agricultural production appear especially vulnerable to injury. The association between this high rate of injury and the prevalence of disability in the agricultural community is not well understood and little research has been conducted or published on the topic. Early studies by Tormoehlen (1982) suggest that approximately 17% of farm operators had physical disabilities that prevented them from completing essential farm work-related tasks. More recent studies (Whitman, 1995, Allen, 1995, and Browning, 1997) further suggest that the increasing mean age of farm operators has led to a higher prevalence of disabling conditions due to age-related diseases such as arthritis, heart disease, stroke, impaired vision and hearing loss. These conditions or symptoms of the aging process are known to contribute, within the population at large, to an increased vulnerability to injury. This is clearly reflected in the growing proportion of farm work injuries involving persons over 60. Most, if not all, farmers, ranchers and agricultural workers are exposed to increased risk of injury, including secondary injury, due to physical or mental limitations that impair judgment, behavior, physical mobility, response time, hearing, sight, touch and other human capacities. The focus of this paper will be to address the physical and mental limitations of those working in agricultural production, how these limitations may translate into increased risk of injury, suggestions for intervention strategies that could reduce the risk of injury associated with disability and recommendations for future research.

Background

For more than two decades, the Breaking New Ground (BNG) Resource Center and Outreach Program have been providing technical assistance to farm and ranch families throughout North America who have been impacted by a wide variety of disabling conditions. Throughout that time the BNG activities have operated under the umbrella of Purdue's Agricultural Safety and Health Program and considerable attention has been given to the potential safety and health risks that individuals with disabilities are exposed to while engaged in farm work. Significant contributions have been made to hazard identification and developing injury prevention strategies. In fact, one of the very first and one of the most recent technical publications produced and widely distributed by the BNG Resource Center addressed the topic of farming safely with disability (Tormoehlen, 1983 and Gruver, 1997). Ongoing efforts have been made to explore, document, quantify and conduct public awareness activities. Means to mitigate the most significant hazards in order to reduce the barriers and risks to individuals who choose to continue working in agriculture in spite of limiting physical or mental abilities have been identified. Part of this effort has been to also respond to the perceptions of rehabilitation professionals who have used the risks of farm work as grounds to prevent or discourage persons with disabling conditions from pursuing careers in agriculture. Such perceptions have been viewed as discriminatory and failed to recognize the overwhelming evidence, which substantiates the successful involvement of individuals, with even severe levels of disability, in agricultural operations. It has been a fundamental position of the BNG Resource Center that every person will at some point experience short or long term disabling conditions and that these conditions and their symptoms should not automatically exclude persons from engaging in agricultural production. Having a disability is also not an appropriate litmus test for determining personal success nor should it be used as a means to restrict the independence of persons with disabilities, preventing their full integration into the community. It is recognized, however, that physical and cognitive disabling conditions can contribute to an increased potential for injury and should be considered in designing workplace safety and health strategies.

What Constitutes a Disability

The concept of disability is vague, not consistently defined, and is more often expressed in qualitative rather than quantitative terms. It is often heavily politicized, used to stir emotions and to estimate the worth of certain groups of individuals. Recent court rulings seem to suggest that disabilities are only those conditions not correctable with the use of assistive devices, medication or changes in behavior. Disability-related organizations generally seek to classify as many people as possible, for political or financial reasons, as being "disabled" but often rely on the well-recognized wheelchair user image that, in fact, is a relatively rare disability type. Since every human is imperfect, and through the forces of aging becomes increasingly so, the term disabled can be accurately applied to everyone at any given time. No one is immune from errors made due to physical limitations, imperfect judgments or actions influenced by environmental factors. Everyone is "unable" to do some things at sometime. Consequently, a strong argument can be made that most, if not all, injuries not considered "acts of God", are fundamentally caused by some form of disability. In other words, human characteristics, or more specifically human weaknesses and imperfections, play a significant role in the vulnerability humans have to injury and their capacity to respond to and recover from injury.

For the purpose of this paper, disability is defined as any human characteristic, acquired either genetically or post-birth due to injury or disease, that limits or impairs human capacity to the point that it contributes to increased risk of unintentional injury. Disabilities can be short term or chronic. Some types of disabilities are readily visible or recognizable such as those associated with mobility, loss of limbs or impaired speech. Some disabilities can be the side effects of certain medications, alcohol or drugs (Pickett, 1996). Disabilities can also be less obvious or hidden including various forms of mental illness, diabetes, loss of skin sensitivity, color blindness, hypertension or impaired hearing. The complications connected with certain disabilities can reduce life expectancy while other types that are relatively severe in nature may have little impact on life expectancy.

The type or level of severity of any disability does not have a direct relationship to the probability of injury, but it is known that certain disability types within certain populations may lead to increased risk of injury. For example, older women with osteoporosis appear more prone to falls and hip fractures, and individuals with a genetic trait known as chromosome 17 deletion may be more vulnerable to develop certain forms of carpal tunnel syndrome from tasks involving repetitive motion. It is, however, not possible at this time to predict injury probability within agricultural workplaces with any meaningful level of accuracy based on disability-related information. In other words, it cannot be ascertained that a spinal cord injury or hearing loss will make a person a more or less safe tractor operator than a person without these conditions. (Some insurance providers offer a 10% discount to drivers with spinal cord injuries.) Such conditions have been observed, however, to have contributed to injuries and may in fact contribute to a comparatively higher risk of injury when not recognized or appropriately compensated for through modified work practices or the use of assistive technology. Any condition, for example, that impairs judgment, mobility, strength, reaction time sight, hearing, touch, and smell can be classified as a disability and be a contributing factor to injury events.

Review of Prior Research

A study conducted by the BNG Resource Center at Purdue University examined the risks of farming with a physical disability, and attempted to identify the safety education training needs of this population (Allen, 1993). The survey involved a sample of farmers and ranchers who were known to have physical disabilities from across the U.S. The most frequently reported disabilities among respondents were spinal cord injuries and amputations providing a more extreme perspective of the disability community involved in agriculture. Farm work-related injuries were reported by 39% the survey participants as the cause of their initial disability, which was more than twice the number of any other injury type. Nearly 81% of those surveyed felt that there were necessary work-related tasks on their farm or ranch that they could no longer perform or were seriously hindered from performing as a result of their physical disabilities. Most frequently reported barriers were associated with loading or moving livestock, hitching implements to tractors and equipment, fueling and routine maintenance of tractors, climbing, and carrying heavy objects. It was clear from the study that farmers with even severe disabling conditions, including spinal cord injury and amputations, were continuing to participate in tasks widely recognized as hazardous by agricultural safety professionals.

Approximately 25% of the surveyed population in the Purdue study believed that they had incurred a secondary injury that was the direct result of their disability. Injuries due to handling livestock were the most frequently reported injury during the previous year, and injuries from falls were the second most prevalent in the study. Of the documented injuries, 43% were severe enough to require professional medical attention.

The Allen study also explored whether or not a farmer or rancher with a physical disability experienced similar types of injuries as their "able bodied" counterparts or was at a greater risk of injury. In most cases, the injury causing agents identified in the study tended to mirror injury-causing agents reported in other injury studies of the general farm population. Even the severity of injury, nature of injury, and body part injured by the participants in the study tended to parallel injury data reported within the general farm population. The exceptions were in the higher number of bruises and pressure sores reported by individuals with spinal cord injuries and increased vulnerability to cold temperatures reported by individuals with amputations.

Sixty percent of the individuals who participated in the Allen study felt they were at a greater risk of being injured on their farming or ranching operation because of their disability. Individuals who reported having a severe disability made up 58% of the population who felt they were at a greater risk. The survey indicated that respondents, who have had their disability for a short time, 10 years or less, felt that they were at a greater risk of being injured on their farm or ranch than those who had farmed for more than 10 years. There was no significant difference between the age groups regarding the respondent's perceptions of who they believed was at a greater risk of being injured

Willkomm (1997) who studied the risks associated with tractor operators with spinal cord injuries found that the most frequently identified injury was related to bumping or scraping lower limbs on component parts when mounting or dismounting their tractors. The most serious injuries reported by this population involved falls when using lifts added to the tractor to gain access to the operator station. In addition, Willkomm noted the increased risk of injury to co-workers due to the modifications made to equipment to accommodate an operator with a spinal cord injury.

A study of Vocational Rehabilitation placements in 1995 indicated that 2.2% or 4,581 individuals were placed in an agricultural-related occupation following rehabilitation (NIDRR, 1998). This percentage of the total number of placements is comparable to the percentage of the population engaged in agricultural production.

An in-person survey of a purposive sample of 201 adult farm workers with disabilities and 66 disabled children in farm worker families in six states found that farm workers experience a broad range of disabling conditions (Strong, 1998). The most commonly reported disability types among adults were back impairments and musculoskeletal problems. Children were most commonly identified with developmental disabilities. The authors noted that their study under-reported disabilities due to the evidence of undiagnosed conditions such as hearing loss, vision impairment and mental retardation. It was of interest to note that within the predominately Hispanic population surveyed, that the term "disabled" and the notion of what constitutes a disability were not clear for many farm workers. The term disabled was closely related to the

ability to work rather than the inability to do work. Those identified with severe disabilities did not consider themselves disabled because they were still able to work. Sixty-one percent of the adults surveyed continued to do farmwork even though they had conditions generally accepted as disabling.

Browning (1998) in his study of injuries to older Kentucky farmers found that those reporting a prior injury that limited their ability to farm were at an increased risk of experiencing a farm-related injury. The author noted that prior work suggested that hearing and vision impairment, the use of prescription medications, and arthritis may increase the risk of farm-related injury.

Potential Risks Associated with Disability in Agricultural Worksites

Observations made over the past 20 years by staff of the BNG Resource Center while conducting hundreds of on-site farm visits with farmers and ranchers with a wide range of disabling conditions have provided a unique perspective of the impact disabilities can have on this population. It has been clear that there is no epidemic of injuries occurring in this population and as observed in other research the nature and frequency of injuries appears generally consistent to injury events in the general farm population. There have been cases, that have been documented, however, where disabling conditions played a clear role in exposing individuals to a greater risk of serious injury or actually contributed to serious farm-related injuries and death. The following are case studies summarized from actual situations that demonstrate some of the potential risks associated with certain disabling types.

Case No. 1: A middle-aged farmer with a spinal cord injury was enabled to return to work through the use of a variety of worksite modifications including the addition of a manlift and hand controls to his combine that allowed him to gain access to the operator's station and operate the machine in the field. While combining corn under extremely dry conditions, a component of the machine overheated causing a fire. The substantial transfer time required to exit the cab of the combine due to reduced mobility and the speed of the fire resulted in a fall to the ground causing injury. At least two other similar cases have been documented with one causing fatal burns to the operator.

Case No. 2: A young adult male with developmental disabilities was placed on a dairy farm as part of a supported employment initiative involving a part time job coach. The job coach provided periodic supervision and instruction in collaboration with the farm owner. Most of the basic and manual tasks were readily assumed and performed satisfactorily. The man, however, was fatally injured when he walked into the path of the revolving beaters on a manure spreader. There was no question that his cognitive ability to recognize and respond to hazards was a contributing factor.

Case No. 3: A middle-aged adult male who owned and operated a dairy farm was experiencing depression, which he attributed to the loss of a loved one. He had begun to drink regularly and heavily and admitted to consuming 6 to 8 cans of beer a day. While attempting to service a piece of operating farm machinery, he became entangled and amputated his arm below the elbow. Chronic alcoholism causing short-term impairment following consumption has been documented

in numerous injury cases but remains a relatively unstudied problem in the field of agricultural safety and health.

Case No. 4: An older adult male farm operator was diagnosed with retinitis pigmentosa and began to lose his sight. He continued to operate machinery causing damage to buildings and machinery and eventually causing injuries to himself and putting other family members at risk. Family members were unable to prevent the man from operating equipment until he had caused a level of damage that made his condition strikingly apparent to himself.

Case No. 5: An adult male farm operator with the loss of lower limb skin sensitivity due to partial spinal cord damage experienced severe burns to his legs while welding. Due to the loss of pain sensitivity, he was not aware of the injuries until he smelled his burning flesh and clothing ignited by sparks and molten metal landing on his unprotected lower limbs.

Case No. 6: Though not resulting in an injury, the risk of potential injury is apparent in the following case. An adult female farmer was partially paralyzed as the result of a stroke and experienced unpredictable, short-term seizures. The condition improved and she was able to use a walker to regain some of her mobility, however, she continued to have seizures. Even though she was restricted from driving a motor vehicle, she continued to operate one of the farm tractors using homemade modifications. The risk of experiencing a seizure during operation was ignored and the potential of injury to herself and others became a serious point of conflict with the rest of the family.

Work done by the BNG Resource Center has attempted to identify and categorize hazards that individuals with disabilities may be exposed to in farm and ranch settings. With few exceptions, most were comparable to hazards that place the general farm population at risk. These categories were addressed by Gruver, et.al. (1977) and are summarized below.

1. Hazards to other individuals, including children, providing assistance to individuals with disabilities.
2. Hazards associated with operation of agricultural equipment including the impact of vision and hearing impairments on operator safety.
3. Hazards present when working with livestock that are extremely unpredictable and powerful.
4. Hazards associated with the high risk for fires and exposure to hot material in agricultural workplaces. Includes need for evacuation procedures, detectors, communication aids and personal protective equipment.
5. Hazards related to excessive exposure to machine vibration, repetitive motion and noise.
6. Hazards associated with climbing and the need for mobility in agricultural worksites.
7. Respiratory hazards due to exposure to toxic gases, dust and agricultural chemicals.

8. Hazards to individuals with spinal cord injuries, amputations, arthritis and other conditions sensitive to temperature extremes.
9. Hazards associated with excessive and repeated exposures to general workplace agents such as sunlight, noise, and microorganisms.
10. Hazards associated with modifications to accepted work practices, modifications to worksites or the use of specialized assistive technology.

Recommended Strategies

The following recommend strategies for addressing the problem of agricultural workplace injuries caused by disabling conditions are categorized under the headings of public awareness, educational resources, design considerations, and future research.

1. Public Awareness

For over 20 years, the BNG Resource Center, and since about 1990, the USDA AgrAbility Program, have conducted national efforts to increase public awareness concerning the potential for persons with disabilities to successfully remain in agricultural-related occupations. Part of this effort has been to address the notion that farm worker and disability are incompatible terms. A significant responsibility of this campaign has been to ensure that persons with disabilities who choose to participate in hazardous work activities are aware of the hazards and appropriately protect themselves from them. In all cases where individuals are assisted in overcoming workplace barriers safety for all involved should be high on the agenda. In many cases, the final choices become personal, but professionals involved with the process need to be aware that they have a duty to consider safety and health implications of every recommendation.

2. Educational Resources

Even though there are few resources readily available related specifically to safety and health issues for those farming with a disability, there is a tremendous amount of information and resources available on general safety and health practices for agricultural workplaces. Deere and Company (1995), for example, has an excellent resource that addresses safety issues relevant to both those with and without significant disabilities.

In addition to the resources available through the BNG Resource Center that were mentioned earlier, The Easter Seal Society has made available a series of fact sheets that provide farm safety tips for various disability types including back injury, brain injury and upper extremity limitations. This information is provided with the caution, however, that no scientific research has been conducted to determine if the recommendations are safe or effective.

There is a need to develop high quality, task specific safety education material for use by farmers and ranchers with disabilities and also rural rehabilitation professionals working with this

clientele. This information could be disseminated through existing channels such as the Cooperative Extension Service.

To the degree possible, targeted safety and health resources should be integrated into existing programs and built upon established principles and standards of workplace safety. As noted, disabilities occur in all levels of severity and resources should address the degree of risk associated with the various levels. This would make more of the information applicable to a broader population.

3. Design Considerations

Until the mid 1980's there were few technical resources or professional consultants available to assist farmers and ranchers with disabilities in redesigning work tasks, fabricating assistive technology or modifying existing equipment and facilities. Most individuals who continued to farm following a disability developed, with little external help, their own solutions. Some of these homemade or locally fabricated solutions were found to be unsafe resulting in injuries, some of which, as already pointed out were severe or even fatal.

Both the BNG Resource Center and the USDA AgrAbility Program have provided assistance in reducing the risks associated with modifying agricultural workplaces, including the use of assistive technology. Broader distribution of resources such as "Agricultural Tools, Equipment, Machinery and Buildings for Farmers and Ranchers with Physical Disabilities" (2000) should contribute to the selection, design and fabrication of safer and more useable forms of assistive technology.

To the extent possible commercially available technology should be recommended to accommodate disabilities in the workplace. It is more likely, but not always the case, that these products will have been designed by an engineer, evaluated for potential hazards, field tested, and covered by liability insurance.

In some cases, there is a need to develop new standards or expand existing design standards to provide clear direction to professionals designing and fabricating assistive devices and making modifications to existing equipment such as tractors and combines. Some of these standards would be channeled through existing voluntary standards organizations such as ASAE or SAE that have jurisdiction over much of the technology associated with agricultural workplaces.

Design strategies that have become a common part of the "Universal Design" approach should be considered and incorporated into new agricultural production facilities and older facilities as they are remodeled. These design concepts have become widely used to successfully enhance the accessibility and usability of a wide range of facilities and products.

4. Future Research

Future research should focus on those issues that have the greatest potential for reducing the risk of injury in the agricultural workplace while allowing acceptable levels of personal risk taking. Data generated by ongoing surveillance efforts provides a useful starting point. In addition,

research is needed to gain a better understanding of the underlying influences that create barriers to effectively addressing certain socially complex issues such as the role played by alcohol, drugs, genetic traits and developmental disabilities (mental retardation) as causative agents to workplace injuries. The following are areas in need of further attention.

- Impact of aging on the vulnerability of injury in agricultural workplaces.
- Genetic predictors of injury including level of intelligence, certain high risk behaviors, and susceptibility to depression, repetitive motion injuries and attention deficit disorders.
- The influence of gender differences on risk taking behavior and vulnerability to injury.
- Role of obesity and excessive weight on increased risk of certain types of injury.
- Documentation of the influences alcohol prescription medications and drugs have on agricultural workplace injury rates.

Conclusion

As a greater emphasis is given to empowering persons with disabilities to live more independently and have greater control over decisions that influence their lives, it will become commonplace to see persons with even severe disabilities involved in all walks of life, including farming and ranching. The experiences of programs such as the BNG Resource Center and the U.S.D.A. AgrAbility Programs have clearly demonstrated that the success level of farmers and ranchers returning to work after a disabling injury or disease is high.

Recent findings presented in this paper along with general observations demonstrate that farm-related injuries are no respecter of persons. Because a person has experienced one disabling injury or condition, he or she does not become immune from another injury or a secondary injury caused by impairments associated with the first disability. Anyone involved with assisting a person to return to the farm or ranch following a disability needs to recognize both the expected hazards and those that are related to specific disabling conditions. This includes hazards that place the disabled worker at risk as well as those that may place bystanders and co-workers at risk.

There is clearly a lack of adequate safety education materials available for use in preventing secondary injuries to those involved in hazardous occupations such as agricultural production. There is a need to develop high quality, task specific safety education material for use by farmers and ranchers with disabilities and also rural rehabilitation professionals working with this clientele. The BNG Resource Center and AgrAbility Program will continue to address this need. Changing attitudes, assistive technology and modern agricultural practices have made it possible for many individuals to return to their homes, communities, and work, to make meaningful contributions. Now, the same ingenuity and commitment are needed to ensure that the risks are minimized.

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