



FARMING WITH A HEARING IMPAIRMENT

Overview of the Problem

More and more studies show that farmers are at a higher risk for developing hearing impairments than the rest of the population. In fact, approximately 6 million of the estimated 12 million Americans who have some form of hearing impairment live in rural areas; and of the 2 percent of Americans who are part of a ranch or farm family, roughly 440,000 of them have some form of hearing impairment.

According to the American Safety Council, noise is the primary cause of hearing loss for most people, followed by injury and disease. This ranking holds true for farmers and farm personnel. The main cause of hearing loss among farmers is thought to be noise exposure from on-farm jobs, not industrial noise exposure from off-farm jobs.

Noise-induced hearing damage begins at an early age on the farm: almost 70 percent of teenagers who live or work on a farm show signs of early noise-induced hearing loss. As the average age of farmers continues to increase, simple age-related hearing loss will add to the total number of farmers with hearing impairments.

Hearing loss can be particularly troublesome for farmers because of the nature of their working conditions. This fact sheet discusses the different types and causes of hearing loss and presents guidelines on how farmers can take steps to prevent damage to their hearing. Farmers with hearing impairments and their families and work partners need to work together to ensure a safe working environment for all. The section "Accommodating a Hearing Loss" focuses on these issues.

Definitions

The term *hearing impairment* refers to all degrees of hearing loss and includes the broad terms hard of hearing and deafness. *Hard of hearing* refers to the loss of sensitivity to sound, either in the ear itself or in the ear nerve. *Deafness* refers to a total or nearly total hearing loss, regardless of the cause.

A person's degree of hearing loss is a quantitative measure (in decibels, dB) of the lowest volume of sound that can still be heard.

- **Slight (25-40 dB):** Difficulty hearing soft or distant speech in church or theater;
- **Mild (40-55 dB):** Difficulty understanding conversational speech in a restaurant or group setting;

- **Moderate (55-70 dB):** Difficulty hearing normal levels of speech (at 65 dB);
- **Severe (70-90 dB):** Cannot hear loud speech or understand speech on the telephone but can hear shouted speech;
- **Profound (greater than 90 dB):** Difficulty hearing even shouted speech.

The three major types of hearing loss are conductive, sensorineural, and mixed. *Conductive hearing loss* (or mechanical hearing loss) results from disease or obstructions in the outer or middle ear and usually affects all frequencies of hearing. Rarely does a person with conductive hearing loss experience a Severe or Profound loss of hearing; and frequently, the individual can be helped medically, surgically, or by the use of a hearing aid.

Sensorineural hearing loss occurs when the delicate sensory hair cells of the inner ear or the auditory nerve have been damaged. Hearing loss ranges from Mild to Profound. Sounds become distorted only at certain frequencies, so a hearing aid proves to be of little help.

A *mixed hearing loss* occurs when there is a combination of conductive and sensorineural hearing losses in the same ear. This loss includes problems in both the outer or middle ear and the inner ear.

Noise Source

Prolonged exposure to noise can lead to a gradual loss of hearing. Major sources of noise on the farm may include machinery, small engines, and power tools. Large machinery such as tractors and combines emit noise levels of 80 to 150 dB. Two-cycle engines such as lawn mowers and chain saws can damage hearing with repeated exposure. In addition, heaters, generators, and radios inside the cabs of tractors and combines can emit high noise levels that may damage hearing. The list in Table 1 shows the noise levels of various sources.

The potential for loud noise to cause a hearing loss depends on how loud the noise is and how long a person is exposed to the noise. As the work environment gets louder, the amount of time a person can safely work there without permanent damage to hearing gets shorter. Table 2 shows how many hours a person can safely be exposed to sound at certain volume levels. These time limits are based on guidelines for industrial workers in Regulations of the Occupational Safety and Health Administration.

Farm personnel should use these limits as a guide to avoid harmful noise exposure. A person who works longer than these recommended exposure times may think, "I'm safe as long as I don't have any pain in my ears." However, just because a noise is not painful does not mean it is not harmful. Damage may be incurred before it is diagnosed or before any hearing loss is noticed.

Research has shown that many farmers have a greater high-frequency sensorineural hearing loss than can be accounted for by aging alone. A repeated pattern of hearing loss is the higher-frequency loss, particularly that which is noise-induced. Much of the hearing loss occurs in the left ear because the left ear is exposed to engine noise when the driver looks over his or her right shoulder during operation. The head shields the right ear somewhat.

Signs of Noise-Induced Hearing Loss

The following are signs of potential or existing damage to the ear that can lead to hearing loss.

- *Difficulty talking to another person while in the equipment operator's position.*
- *ringing in the ears after a day's work around loud equipment or machinery. The buzzing or ringing remains for a few hours after exposure.*
- *Muffled sounding speech of others after a day's work on the tractor. This loss of hearing disappears in a few hours.*

Preventing Noise-Induced Hearing Loss

Farmers and farm personnel should take preventive steps before any of these symptoms of hearing loss appear. The first step in preventing a noise-induced hearing loss is to identify the sources of noise in the shop and around the farm. These sources may not seem immediately obvious, so thorough investigation is necessary. Once sources are identified, reduce exposure to high levels of noise in one of the following ways.

Reduce the level of noise at the source.

The best way to prevent noise-induced hearing loss is to remove the noise source or reduce its volume to a safe level. Removing the noise source is rarely feasible in work environments, so it is important to identify steps that may be taken to reduce its volume.

- *Replace worn, loose, or unbalanced machine parts to reduce vibration.*
- *Lubricate machine parts to reduce noise created by friction.*
- *Enclose the source in a sealed compartment to reduce noise levels.*
- *Install a high-quality muffler on all engine-powered equipment to reduce vibration and noise produced by air flow.*
- *Mount the noise source on rubber blocks or springs to reduce vibrations.*

Isolate the operator from the noise source.

If the noise level cannot be reduced to a safe level at the source, attempt to isolate the operator from it. An obvious example is a tractor cab. In recent years, farm machinery manu-

facturers have designed cabs that reduce noise exposure to within safe limits by isolating the operator from the noise source.

Wear hearing protection devices.

Hearing protection devices can dramatically reduce the level of noise reaching the ear drum and consequently reduce the risk of hearing loss. However, it is best to reduce noise at the source or to isolate the operator from the noise because hearing protection devices can be improperly fitted or used, resulting in damaging levels of noise reaching the ear. Hearing protection devices may also be lost, forgotten, or damaged, again resulting in no protection from harmful noise.

Many hearing protection devices are sold commercially. Generally, they fall into the categories of ear plugs or ear muffs. *Ear plugs* are small, soft inserts that are placed into the outer ear canal. To be effective, they must block the ear canal totally with an air-tight seal. Ear plugs are available in many shapes and sizes to fit individual ear canals, or they can be custom made.

Earmuffs are worn outside the ear, actually covering the entire outer ear. A soft rubber "gasket" is attached to the plastic shell for each ear. This gasket rests against the head to form the air-tight seal necessary to be effective. For this reason, most earmuffs will not seal around eyeglasses or long hair. Earmuffs are held in place by an adjustable band with sufficient tension to hold the earmuffs firmly in place around each ear.

Properly fitted ear plugs or muffs reduce noise 15 to 30 dB. Quality ear plugs are more suited for low frequency noise and earmuffs for high-frequency noise. Simultaneous use of ear plugs and earmuffs usually adds 15 dB more protection than either device used alone. Combined use should be considered when noise exceeds 105 dB (American Academy of Otolaryngology, 1990).

Ear plugs have two advantages over ear muffs: (1) they offer greater comfort and portability and (2) they cut short levels without masking the direction of sounds. Muffs make it more difficult to locate the source of sounds. Also, summer heat makes wearing muffs uncomfortable, and sweat will harden the muff cushions. A hard cushion can cause a poor seal, reducing the effectiveness of the earmuffs to block damaging sounds.

Accommodating a Hearing Loss

Farmers can and do use the same technology nonfarmers use to accommodate their hearing losses (e.g., assistive listening devices). Where farmers are unique, however, is in their work environment. Farmers need more than assistive listening devices to accommodate their loss of hearing. They also need to develop accommodating work strategies for the farm.

When working with others on or around farm equipment, a farmer with a hearing impairment should use a clearly defined set of hand signals for safe, efficient, precise communication. The American Society of Agricultural Engineers developed a set of agricultural hand signals to be used around loud farm equipment. These signals should be suitable for most farmers with hearing impairments to use. Wherever audible alarms are used on the farm, visual alarms should be

installed as well to warn an operator who may not hear the alarm sound.

Farmers who wear hearing aids may find communication difficult inside farm buildings that have sheet-metal roofs and siding, such as pole barns. Metal surfaces tend to reflect background noises that are then amplified by the hearing aid, making the noise more likely to “cover up” any intended message. Adding sound-absorbing materials to the inside surfaces of metal buildings may reduce the amount of background noise amplified by the hearing aid and result in clearer communication while inside those buildings. Fibrous and porous materials such as mineral fibers, glass fibers, and open-cell foams have good sound-absorbing qualities.

Farms often have a great deal of “traffic” as automobiles, tractors, and other equipment are moved from one point to the next. Just as often, the farmer is busy accomplishing one task and preoccupied with several other tasks awaiting completion. For safety, a farmer with a hearing loss must remember to always look before crossing any road or vehicle path on the farm.

A noisy bearing, loose chain, or other sounds that indicate needed machine maintenance or imminent machine failure may go unnoticed by a farmer with a hearing impairment, thus creating a safety hazard. Training family members or a neighbor to conduct frequent maintenance checks is one way to increase safety.

Many farm operators rely on the sound of a tractor, combine, or other machine to detect normal functioning of the machine as it is being used. An operator with a hearing impairment may experience difficulty making this assessment. In certain cases, responsibility for operating the machine may need to be delegated to an employee or a family member.

TABLE 1

<u>dB (A)</u>	<u>SOURCE</u>
0	Weakest sound
15	Average threshold of hearing
20	Whisper
60	Normal conversation
80	Road traffic
85	Inside acoustically insulated protective cab in field
90	Pneumatic drill, chopping silage
100	Power mower, ATV, squealing sows
105	Tractors, combines
110	Table saw cutting through oak board
115	Chain saw
120	Jackhammer, shotgun blast
140	Jet takeoff

TABLE 2

<u>Maximum Duration Per Day Hours</u>	<u>Sound Level</u>
	<u>dB</u>
8	90
4	95
2	100
1	105
½	110
¼	115

Case Studies

Adam: Kentucky farmer

Adam, age 28, works as an agricultural professional in Kentucky. He also operates a cash grain farm and raises swine and sheep. While growing up, Adam operated many chain saws, farm tractors, small engines, and machinery without any hearing protection. In 1982, after two years of experiencing difficulty hearing, Adam was diagnosed as having a mild noise-induced hearing loss. He had lost 40 percent of his hearing in one ear and 30 percent to 35 percent in the other ear. Adam continues to operate farm tractors and other equipment, but now wears ear plugs and/or earmuffs to protect the remainder of his hearing.

Background noise from crowds makes hearing more difficult for Adam. He also has some trouble hearing in classrooms. His hearing aid amplifies the background noise and makes speech more difficult to understand. Adam has also compensated for his hearing loss by learning lip-reading (speech reading).

In his job, Adam receives and makes many telephone calls. He conceived a clever means to keep his hearing aids from “squealing” on the telephone: he places a Styrofoam pad over the telephone receiver to clearly understand the caller and prevent the caller from being interrupted by the squeal.

Adam is an advocate for the use of hearing protection. He advises others to wear ear plugs and/or earmuffs as much as possible when working around small engines and machinery and when hunting. He emphasizes, too, that a communication system between the farmer and other farm personnel is essential to effective farming.

Bob: Wisconsin farmer

Bob Schendel is a 47-year-old dairy farmer with four children. Bob has had a hearing loss since he was a small child and now wears a cochlear implant. Bob was exposed to two-cylinder John Deere tractors and several other noisy equipment like vacuum pumps. Bob’s hearing has always been impaired, and it was degenerative to the point that he could not even hear a forage chopper run. He had to pass certain FDA guidelines before he could get a cochlear implant. He tried hearing aids before the cochlear implant but did not experience improved hearing.

The cochlear implant is the only adaptation Bob has made. He did not wear the implant when he milked because he didn’t want to get the microphone dirty or dusty from feed dust. He does not wear it when driving tractors because the noise of the turbochargers bothers his ears. The word processor box he wears in his shirt pocket cost over \$5,000. “You don’t want to ruin it,” he says. Bob is also an advocate of hearing protection and advises other farmers to “wear ear plugs while running noisy equipment no matter how uncomfortable it may be. If they ever had a hearing problem and lived for 45 years, they would take my advice.”

Chris and Craig: Ohio

Chris and Craig Bell are six and 11 years old, respectively. The boys and their older brother help their parents raise grain (corn) and beef cattle. They enjoy spending time to-

gether in the woods near their home and are members of 4H.

Chris and Craig have severe hearing losses. Both boys were born with their hearing impairments, although Craig's hearing loss was not diagnosed until he was four. He was initially diagnosed with a mild hearing loss that gradually worsened and has since stabilized. Chris's hearing loss registers at 105 dB, which is equivalent to maintaining 5 percent of his hearing.

Chris and Craig have compensated for their hearing losses in a number of ways. They both wear hearing aids in each ear and try to sharpen their listening skills through techniques taught to them by their school teachers and parents. The boys lip-read and use sign language, but they try to concentrate on listening.

Getting the boys' attention presents a challenge for everyone, especially their parents. The Bell family has developed its own system of communication and continually strives to improve communication as the boys grow older. Chris and Craig wear their hearing aids at full volume most of the time in order to hear, but Mrs. Bell still has trouble getting the boys' attention in the barn, for instance, because of the echo from the sheet metal construction.

The boys' hearing aids do squeal, but rarely so. To use the telephone at home, the boys can use a speaker phone to talk with other people instead of placing the telephone receiver against their hearing aids and interrupting the caller with their

squealing hearing aids. The speaker phone has worked very well for the boys and their family.

Everyone in the Bell family constantly looks out for one another to assure themselves of the boys' whereabouts. They don't want to experience any farm accidents or "close calls" due to the boys' hearing impairments.

The Bell family constantly seeks to improve communication on and around the farm. They notified the town highway department to install two "deaf child area" road signs to alert motorists from the east and west that their family has children with hearing impairments. To further improve communication, the Bells are now investigating various communication systems to signal the boys and grab their attention. They may invest in a simple FM system of two-way radios so that everyone can better communicate with one another.

Conclusion

Farmers and ranchers work in conditions that frequently expose them to high noise levels. Their risk of sustaining a noise-induced hearing loss can be reduced or prevented by first identifying sources of loud noise, and then by taking steps to reduce exposure to those sources. If a hearing loss occurs, appropriate combinations of technology and on-farm work strategies may be employed to accommodate the hearing loss while continuing to farm.