Improving Silage Storage

Keeping Idaho's Water Clean

1. Silage moisture content

Silage is the conversion of a wet, unstable forage product to a wet, fermented, and stable forage product. Silage can be made from corn and other forage crops, such as grass and alfalfa. The amount of leachate (silage juices) produced varies with the material stored, its moisture and nitrogen content, and handling and storage conditions. Of these, moisture is the most crucial.

Research indicates that materials stored at 70 percent moisture content or higher can produce leachate. For corn silage, the amount produced varies from a trickle at 75 percent moisture to 79 gallons per ton at 85 percent moisture. About three-quarters of the leachate is produced in the first three weeks of storage, although it can continue to flow for up to three months.

Farmers can use several methods to reduce leachate production from silage. The most effective of these is to vary cutting and harvesting times, allowing the material to dry down or wilt in the field (*Figure 1*). Although this may not always be possible, it can reduce leachate production by 100 percent. Other methods include cutting or crimping the materials or adding moisture-absorbent materials to the silage as it is stored. Adding absorbent materials not only reduces leachate, but can also raise the nutrient value of the silage. Materials to use include alfalfa hay or cubes, beet pulp, rolled barley, ground corn, newsprint, and bentonite clay. Most of these

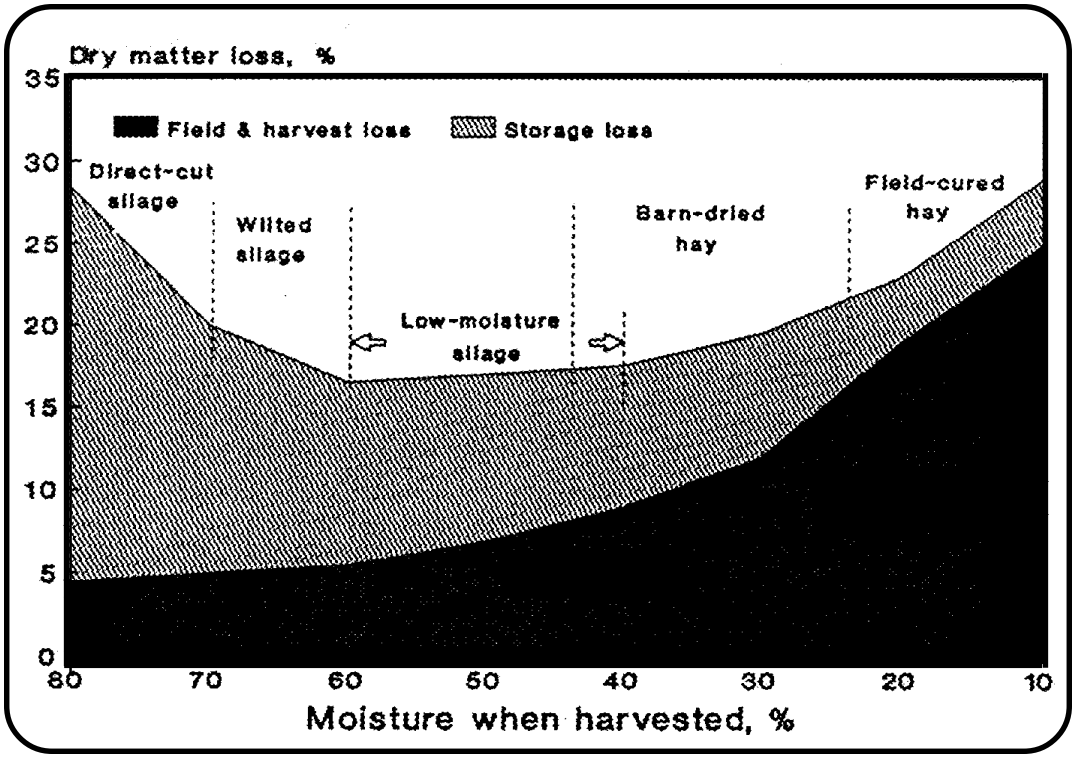

***Figure 1*: Estimated total field and harvest loss and storage loss when grass or legume forages are harvested at varying moisture levels and by alternative harvesting methods.** *Source: Forages: The Science of Grassland Agriculture, 1980.*

materials will absorb from one to 200 times their weight in water. To be effective, enough must be added to absorb the anticipated leachate.

2. Silage storage

The crop is allowed to field wilt to the proper moisture content before chopping to ensure proper ensiling. Silage with a higher moisture content is usually put into horizontal silos. High-moisture silage and haylage may produce significant amounts of silage juice. A system for collecting any leachate is needed in these situations.

Although many older silos may have dirt floors and may have been dug into the subsoil three to six feet below ground level, new silos are built with concrete foundations and floors. Bunker, pit, or trench silos on bare ground present a greater risk to ground water.

3. Silo location

To prevent possible water contamination, silos should be located as far away from wells and surface water sources as practical. Silos should be located downslope from wells and surface water whenever possible. State regulations require that any potential contaminant source be located at least 50 feet away from any water supply well. Proper location will also prevent silage juices from entering surface water sources.

Minimum separation distances should guide new well installations. Make every effort, however, to meet or exceed current recommendations whenever possible. This will help to assure protection of your well water from contamination.

4. Silo design and construction

Most tower silos being built today have concrete interiors. They are built on concrete foundations, with a drain near the base to allow venting of pressure that may develop.

Silage bags are increasing in popularity in the Pacific Northwest. They can be used to store silage varying widely in moisture percentage. Leachate can pool in the bottom of the bag and leak out when the bag is opened or ripped accidently. The floor of an area used to store bags of silage should be graded, so leachate moves to a lagoon. Most silage bags are used only one time and then discarded.

Horizontal trench silos excavated into the ground may affect ground water, especially in coarse soils and sites close to the water table. Properly compacted clay soils and concrete floors can limit leachate seepage.

The type of silo on your farm often has less effect on the potential to contaminate ground water than the condition of the silo. For example, an old wooden silo with an earthen floor may pose a higher risk than a bunker silo with a concrete floor (*Figure 2*). However, older structures can be re-lined to make them relatively watertight.

Silo caps or covers keep rain water from entering the silage, preserving a quality silage, and reducing weather loss and spoilage. They also reduce the potential for producing leachate. Horizontal silos should be covered with a plastic sheet. Tires can be used to keep the cover in place.

It is important to divert clean water away from new and existing silage storage structures. Diverting clean water away from silage in vertical and horizontal silos can protect surface and ground water.

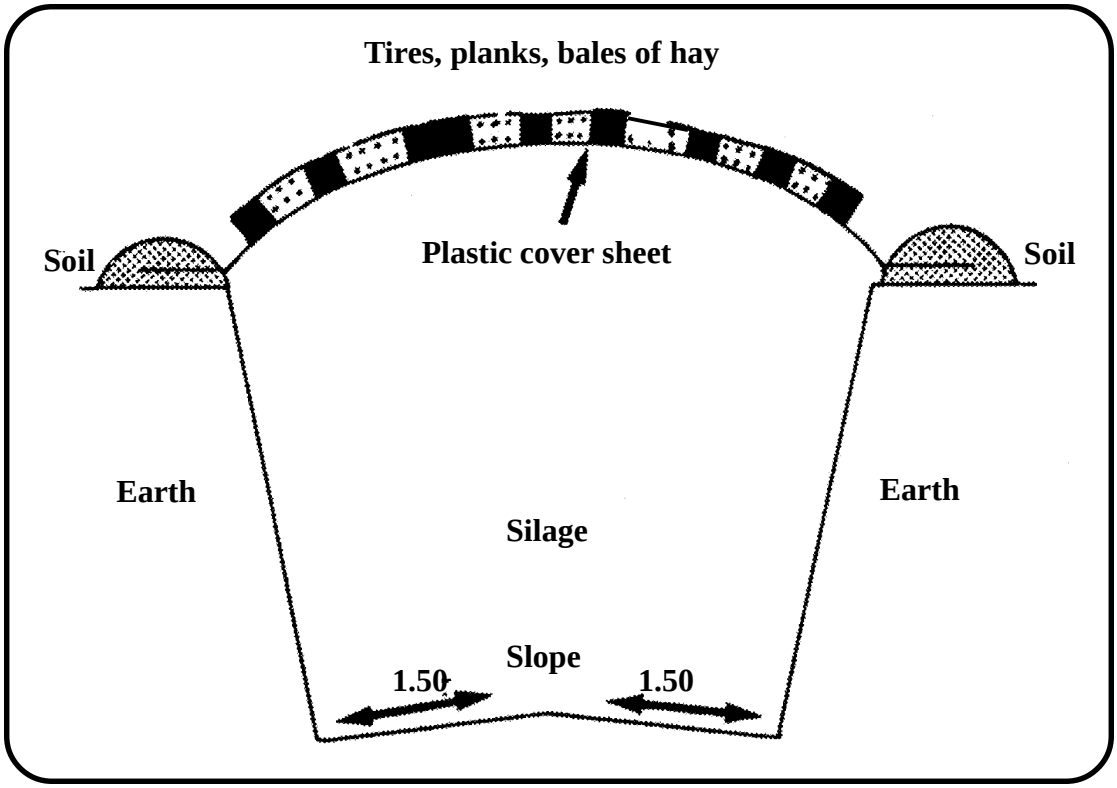

Figure 2: **Basic silage trench.** *Source: Field Guide for Hay and Silage Management in North America, 1991.*

5. Leachate collection and use

Leachate can be collected from tower, trench, and horizontal silos by channeling the liquid into a water retention structure, usually a pond or lagoon lined with concrete, clay, or plastic. Drain tiles around tower silos can be used to collect any seepage from the silo. Horizontal silos use channels to direct seepage into a collection area. Contact the Natural Resources Conservation Service (NRCS) for assistance with design.

Nitrogen in leachate has significant fertilizer value if applied during spring or early summer. Because of its high ammonia content, leachate can burn grasses and remove oxygen from the soil. Farmers who consider spreading leachate on land should consult a soil specialist to determine how much leachate can be safely spread on each field.

Contacts and References

Who to call about...

Silo design and construction

• Your local Natural Resources Conservation Service (NRCS), county Cooperative Extension System office, or Extension agricultural engineer, (208) 885-6182.

Leachate control planning and design

• Your county Cooperative Extension System, NRCS, or Soil Conservation District office.

What to read about...

Publications are available from sources listed at the end of the reference section. Refer to number in parentheses after each publication.

Planning and design criteria, general information

• *Field Guide for Hay and Silage Management in North America,* 1991. Published by the National Feed Inde-gredients Association, this document is an extensive, practical reference on hay and silage managment. (1)
• *Silage Managment in Queensland,* 1984. This Australian publication contains a wealth of information on silage, including growing, harvesting, ensiling, and feeding out to animals. QI83028. (3)
• *Dairy Housing and Equipment Handbook*. Midwest Plan Service. MWPS-7. (2)
• *Beef Housing and Equipment Handbook.* Midwest Plan Service. MWPS-6. (2)
• *Farm and Home Concrete Handbook.* Midwest Plan Service. MWPS-35. (2)
• *Tilt-Up Concrete Horizontal Silo Construction.* AED-15. (2)

Publications available from...

• Your county Cooperative Extension System office. There may be charges for publications, postage, and sales tax.
• Your county Cooperative Extension System office or the Midwest Plan Service, Iowa State University, Ames, Iowa, 50011, (515) 294-4337.