INTRODUCTION

In many regions of the world, the climate is not suitable for forage growth during much of the year. In these regions, forage must be conserved through harvest and storage to feed animals during the months when fresh forage is not available. A primary goal in forage conservation is to maintain the crop dry matter (DM) and nutrients with minimal loss. The amount of loss that occurs is influenced by the type and size of equipment and storage facilities used, management decisions, and weather. The major constraint for reducing losses is the cost of the required technology. Costs of production must be balanced with system performance (including losses) to select the best forage systems.

Many harvest and storage systems are used, but the major options are dry hay and silage production. Hay can be harvested in bales of various sizes, shapes, and densities. To produce dry hay, forage is normally dried in the field to a moisture content of less than 200 g/kg. Hay may be harvested at moisture contents up to 280 g/kg, but further processing or treatment is required for proper storage. Field curing of dry hay in thin, wide swaths requires 3 to 5 d of drying. In heavier windrows, field drying may require 6 to 7 d. Rain during the curing process can prolong the drying many more days. Hay that lays in the field more than two weeks is often not suitable for animal feed.

Losses during hay harvest and storage range from 15 to 100% of the initial forage DM. For hay dried under relatively good drying conditions, losses are 15 to 18% (Rees, 1982; Rotz and Abrams, 1988). Rain damage increases the loss by up to 20% (Rotz and Abrams, 1988) and with extended poor drying conditions, the whole crop can be lost. Average losses in hay making are estimated between 24 and 28% (Hodgson et al., 1947; Hoglund, 1964; Waldo and Jørgensen, 1981; Wilkinson, 1981; Buckmaster et al., 1990). Most of this loss occurs during harvest with about 5% loss during the storage of dry hay.

To make silage, forage is normally wilted in the field to a moisture content between 300 and 650 g/kg which reduces field curing time to between 1 and 4 d. Silage is stored in tower and bunker silos, stacks, bags and wrapped large round bales. The handling of wetter material and the reduced field curing time lead to lower harvest losses than in hay systems, but storage losses are greater. Average losses in silage production are 14 to 24% with about half of this loss occurring during storage (Hodgson et al., 1947; Hoglund, 1964; Waldo and Jørgensen, 1981; Wilkinson, 1981; Buckmaster et al., 1990).