CHAPTER 31

Aerating Grassland Prior to Manure Application Reduces Runoff and Nutrient Loads

Agricultural activities may contribute nutrients, pesticides and sediments into surface water through surface runoff, and regions that use large quantities of manure and fertilizer tend to have concerns over quality of surface waters (Chambers et al. 2000; Sharpley et al. 1998). Because manure is usually surface applied on grassland, the manure is susceptible to loss in surface runoff, depending on slope and soil characteristics. Full (closed slot) injection into perennial grass swards, which prevents runoff, is rarely utilized because of potential damage to the sward or difficult soil attributes such as stones which can prevent injection or damage equipment.

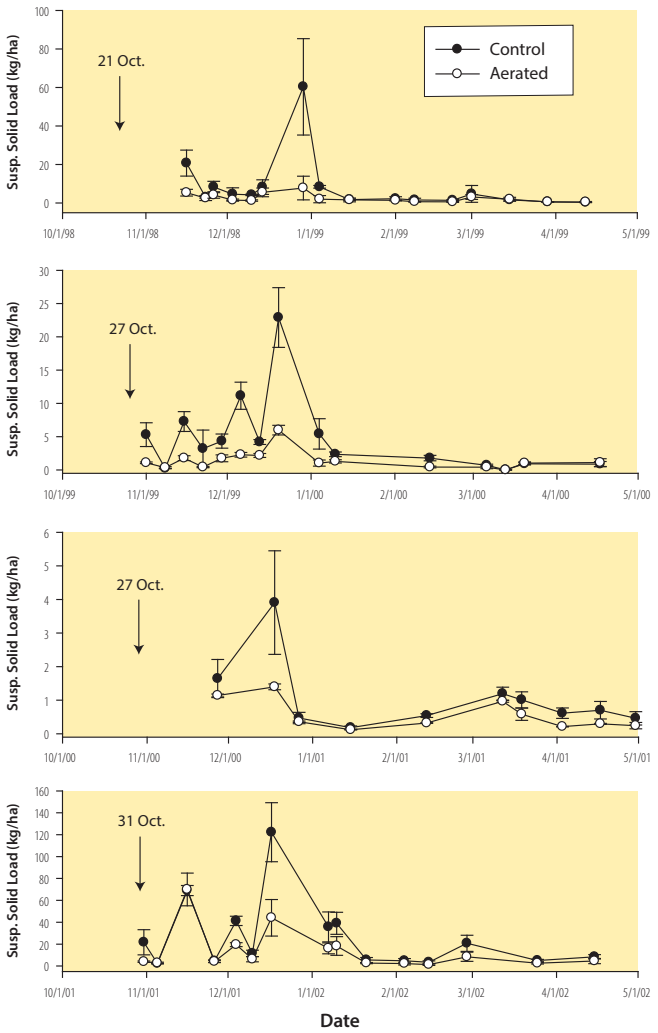

Figure 1. Suspended solid loads for runoff events following manure application on aerated and non-aerated sloping grassland during four winter seasons in coastal BC. Arrows indicate dates of manure application (Data adapted from van Vliet et al. 2006)

Mechanical soil aeration in grassland has been suggested as a management practice to relieve surface compaction and improve forage stand health. Studies using rainfall simulators have shown the potential for soil aeration to reduce nutrient runoff from grass fields treated with manure (Pote et al. 2003; Shah et al. 2004). We tested the effect of soil aeration before manure application on nutrient runoff and leaching under high rainfall winter conditions in south coastal British Columbia, Canada (van Vliet et al. 2006).

Our study showed that mechanical aeration prior to surface application of liquid manure can be an effective tool for reducing runoff volume and loading of solids and nutrients from a sloping grassland (Fig. 1). The beneficial effects of aeration were observed under greatly contrasting amounts of fall/winter rainfall. Over the four-year study, aeration reduced total runoff volume by 47-81%, suspended solids by 48-69%, volatile solid loads by 42-83%, total N loads by 56-81% and total P loads by 25-75%. Aeration also reduced loads of soluble ammonium by 56-81% and dissolved reactive P by 60-96%. Even with aeration, runoff events immediately after manure application posed the greatest runoff risk. While the aeration slots gradually filled with soil and closed, there was low risk of significant surface transport of nutrients after the first three runoff events, particularly with aeration. Aeration slightly increased leaching of nitrate but did not affect other nutrients. Mechanical aeration produced little soil disturbance and little damage to grass plants in contrast to deep injection (Rodhe and Etna 2005).

Overall, mechanical aeration of grassland appears to be a practical method for mitigating runoff and associated nutrient transport from surface applied manure, without impacting grass yield. However, even with aeration, it is important to avoid manure application if a large amount of rainfall is anticipated within several days. Also, best results are achieved when the soil is not saturated and has good infiltration.

References available online at www.farmwest.com

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