



Figure 3. Michigan milk production and milk/cow, 1998-2001.

Forage Management

Re-evaluating Manure Application to Alfalfa

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Dairy producers have utilized manure (slurry) as an important nitrogen source mainly for corn, grasses, and small grains. Considerable research has been conducted on fertilization of alfalfa and grasses with inorganic fertilizer. Historically, manure application to alfalfa has not been recommended because of concerns of nitrogen fixation shutdown, possibility of stimulated competition from grasses and weeds, and possible mechanical problems with fouling of harvested forage.

Manure application to alfalfa, however, is being re-evaluated. Why? There are several reasons. First, more dairy cows were added to farms in recent years resulting in increased manure production and a lack of farm land available for manure application. Second, tight profit margins made dairy producers re-evaluate manure as a valuable fertilizer source. Third, environmental concerns by the public as well as the government became a serious issue and now animal production is targeted as one of the most serious non-point sources of pollution. Fourth, alfalfa has a great potential to take up high amounts of manure nutrients

compared with other annual crops. Fifth, better manure handling systems have been developed in recent years. Therefore, it will be very important to make optimum manure nutrient management decisions in alfalfa production in terms of efficient manure nutrient utilization as well as environmentally sustainable agriculture.

A Valuable Nutrient Source

Dairy manure can be viewed as either a waste disposal burden for dairy producers or as a valuable nutrient source for forage crops. Dairy manure contains secondary and micronutrients (Cu, S, Zn, and B) as well as macronutrients (N, P, and K), which can be utilized efficiently by forage crops as a valuable fertilizer source. One dairy cow (1400 lb body weight) produces about 208, 84, and 168 lb of nitrogen, phosphate, and potash per year. If you calculate nutrient values of manure into equivalent chemical fertilizer nutrient values, utilizing dairy manure as a fertilizer source becomes cost-effective. In addition, dairy manure contains organic matter that can improve soil quality.

Alfalfa has become one of two dominant forage crops for feeding dairy cattle; the other being corn silage. In general, most manure has been applied to non-legume crops such as corn, which

number of dairy operations has declined but the cows from exits have been almost exactly absorbed by expansions and new operations in Michigan. The increase in total milk production has been driven by the milk production per cow. As Figure 3 clearly illustrates, Michigan milk production and milk production per cow movements track each other very closely.

results in application beyond the capacity of nutrient uptake of corn. This excessive or poorly timed land application of nutrients also has contributed to environmental problems and public health concerns such as ground and surface water contamination.

Alfalfa has a unique root system and nutrient utilization capability. Alfalfa has a deep tap-root (more than 3 ft), which is beneficial in scavenging nutrients that otherwise can be leached into the soil and contaminate ground water. About 480, 120, and 360 lb of nitrogen, phosphate, and potash per acre per year can be utilized by alfalfa, which is a much higher nutrient removal than corn and small grains. In an effort to reduce environmental impacts, applying dairy manure to alfalfa fields will provide more opportunities for manure utilization by increasing the crop acreage on which to spread manure. The good news about manure application to alfalfa is that alfalfa can utilize nitrogen from the two sources, symbiotic nitrogen fixation and soil nitrogen from organic (manure) or fertilizer sources. Applying dairy (slurry) to alfalfa generally reduces the amount of nitrogen fixed by the alfalfa root nodules, which is good in terms of manure nutrient utilization because alfalfa will absorb nitrogen from dairy

manure as a substitute for nitrogen fixation.

Because alfalfa is an expensive crop to produce, proper manure nutrient management is necessary to maintain good stands for high yield and forage quality. There are several important things to consider before manure is applied to alfalfa fields.

1. Timing of Application

Timing dairy manure application on alfalfa presents many opportunities. In particular, multiple harvests (3 to 5 times per year depending on climate) provide times during the year when some fields are available for manure application while other crops, such as silage corn, are still growing. Dairy manure can be applied to the fields at different times such as before planting (pre-planting), right after each cutting, and on snow covered ground under certain circumstances. Some producers apply dairy manure (slurry) to the field, then disk and harrow before planting. Manure should be applied uniformly before planting without having big chunks of manure that might be detrimental to seed-soil contact. When dairy manure is applied after cutting, it is best to apply within 3 to 5 days after cutting (depending on growing temperatures). Normally manure application right after the last cutting of the season is not recommended because alfalfa plants become dormant and

growth almost stops. So the capability of utilizing dairy manure by alfalfa after the last cutting of the season is minimal and high application of dairy manure might raise some concern for surface run-off and leaching problems.

What about manure application to the frozen ground in alfalfa fields? In a real farm situation, manure storage facilities should be emptied to allow storage of manure during the winter period. To do that, dairy manure should be applied to fields in mid to late November in some areas like northern Michigan. Applying manure to snow ground of alfalfa fields can be an option as long as the field doesn't have a steep slope or sandy soil type. Because alfalfa has its highest yield at the first cutting, manure applied on snow ground in the previous year will be mineralized and utilized by alfalfa the following spring.

2. Rates of Application

Proper application rates depend on forage crop species, soil test results, yield goal, and field slope. As mentioned above, alfalfa takes up greater amounts of nitrogen than other crops. Soil testing is essential for determining crop plant nutrient needs. If no further nutrients are recommended to optimize crop yield, manure application to alfalfa might create some surface run-off and leaching problems. The key to good soil test results is proper sampling. The samples should represent a whole field.

Although dairy producers tend to be optimistic, overestimating yield goals will result in excessive nitrogen applications. This can lead to a potential loss of income and potential environmental impacts such as surface- and ground-water contamination. In particular, higher rates of dairy manure (slurry) application to sandy soils on steep slopes in alfalfa fields late in the growing season will maximize nitrate leaching potential.

3. Solid Content of Dairy Manure

Controlling solid content of dairy manure is critical. When manure is surface-applied, smothering alfalfa plants, in particular crown buds and auxillary buds by solid manure content is possible and will reduce stand persistence. During hot, dry summer weather, it is important to lower solid content in manure because of susceptibility of smothering and scorching the alfalfa plants. It is safe to apply dairy manure with less than 8 % solids content (slurry) when manure is surface-applied.

In conclusion, applying a dairy slurry several times per year to alfalfa appears to be a beneficial practice in a forage-dairy system. Properly managed dairy slurry application to alfalfa would increase the land available for manure application and reduce environmental impacts and chemical fertilizer costs.

Dairy Grazing – True, False or a Draw

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will be parlor design, an update on a multiple state grazing economics study, and New Zealand dairy genetics. Call Bill Bivens at (517) 788-4292 or Ben Bartlett at (906) 439-5880 for more information.

What is your opinion of grazing lactating dairy cows? Take the following quiz and see how your opinions of grazing compare with the current level of grazing knowledge. Grazing your lactating cows is another way to manage your herd that has different strengths and weaknesses as compared with year around barn feeding. If you want more information about dairy grazing, future MDR articles will examine economics of grazing and how to get started, or you can call your local MSU extension person for more information. **The Great Lakes Grazing Conference also is being held in Battle Creek on February 11 and 12, 2002.** Some of the dairy topics

Dairy Grazing Quiz

1. Turning cows out to pasture will decrease milk production? true/false/draw
2. Grazing is less harvest efficient and requires more acres? true/false/draw
3. Grazing is just for small herds? true/false/draw
4. Grazing cows have fewer health problems? true/false/draw
5. Grazing cows live longer than barn cows? true/false/draw