

Are manure and established alfalfa a good mix?

They can be but make sure you know how to get the most benefit from manure nutrients while also protecting the environment

By *Quirine Ketterings and Karl Czymmek*

For nutrient-use efficiency, dairies tend to prefer applying manure to corn and forage grass fields. Alfalfa is a different story. Under proper management, it typically meets its nitrogen (N) requirement through biological N fixation, making N from other sources unnecessary if conditions for N fixation are good.

In reality, though, nutrient management plans for many dairies increase the likelihood that manure must be applied to alfalfa fields since their plans limit manure application to corn and forage grasses to crop N needs. Plus, newly harvested alfalfa fields may, at times, be the only ones available for manure application.

Fortunately, when a choice must be made, certain characteristics of alfalfa make it more appropriate for manure application than exceeding N needs on corn or grass fields. For one thing, alfalfa has a deeper rooting system than grasses and corn. It also has high potassium (K) and phosphorus (P) demands and the ability to reduce N fixation when there's a readily available N form

already present in a field.

Manure application to alfalfa or alfalfa-grass stands raises questions about application rates, methods and timing for production – both dry matter yield and forage quality. What about stand survival and longevity, and the environmental impact of manure on alfalfa?

To answer those questions and learn more about the advantages and disadvantages of applying manure to alfalfa and alfalfa-grass stands, we conducted a search of scientific literature. Here are findings in eight areas:

1. Nitrogen Needs and Losses

- For established stands in New York State, an average annual yield of 4.5 tons dry matter (DM) per acre is common. Given a 2.7% average N concentration, a 4.5-ton crop removes about 250 pounds of N per acre annually. A DM yield of 6 tons per acre removes a little more than 300 pounds of N per acre per year.

A pure alfalfa stand can obtain this entire N



Established alfalfa-grass stands with more than 60% grass are better alternatives for manure application than newly established straight alfalfa stands.

FYI

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- This article is based on a literature review paper that will appear in an upcoming issue of Forage and Grazing Lands (www.plantmanagementnetwork.org/fg/) and was prepared by a multidisciplinary team at Cornell that included Erica Frenay, Jerry Cheney, Stuart Klausner, Larry Chase and Ynte Schukken Services.

through biological N fixation, although the soil will supply some of the N as well.

- Established alfalfa-grass stands with more than 60% grass respond to extra N because of the grass in the stand. These fields are better alternatives for manure application than newly established clear alfalfa seedings.

- Fertilization of a mixed alfalfa-grass stand tends to favor the grass over the alfalfa, resulting in greater N needs with age of the stand. So managers must balance the convenience of applying manure to hayfields with the increased competition from grasses.

Adding nitrogen from other sources suppresses N fixation, but it's uncertain by how much. Several studies show biological N fixation can still supply 20 to 25% of the total N in the crop even when large amounts of additional N are applied.

To minimize annual manure N leaching losses, manure application rates should not exceed the equivalent of 75% to 85% of N removed in the harvest.

- Surface application of manure can lead to N losses through volatilization. In addition to that and runoff, direct flow of manure to subsurface drains can cause significant N loss and environmental concerns. (See don't ignore drainage tiles, page 27)

Deep cracks in the soil, root channels and earthworm burrows promote preferential flow of manure to tile drains especially if liquid manure is applied when soils are on the wet side. Monitor tile drain outlets when applying liquid manure to tiled fields.

- It's common and convenient to apply manure shortly before plow-down and rotation to corn. At that point, alfalfa injury isn't a concern, and sod fields can better support equipment traffic if spring conditions are wet.

However, applying manure at this time, except at low rates, should be discouraged since first-year corn can get all of its N needs from the plowed sod. Too much extra N from manure can lead to an increased risk of N leaching.

2. Weed Pressure

- Weed pressure tends to increase with soil fertility levels. Be prepared to handle the extra weed pressure, particularly in the establishment year, with herbicides or timely clipping manured fields.

3. Compaction

- When manure is applied to established stands, high soil moisture levels combined with heavy application equipment can result in severe com-

paction. Up to 100% plant mortality can result in the compacted areas.

- The following practices can minimize wheel traffic damage: Plant traffic-tolerant varieties; use small tractors for cutting, raking and harvesting; avoid unnecessary trips across fields; use larger harvesting equipment; and avoid tractors with dual wheels.

4. Burn, Smothering or Salt Injury

- To reduce the risk to established stands, don't exceed 4,000 gallons of liquid manure per acre per application.

- Application of semisolid manure isn't recommended but if done, limit it to no more than 10 tons per acre.

- Delaying manure application after cutting increases burn risk as new leaves are most sensitive to ammonium and salts in the manure.

5. Phosphorus Accumulation and Loss

- An average alfalfa-grass stand removes about 13 pounds of P₂O₅ per ton DM. Repeated P applications in excess of crop removal will increase soil test P. Over time this will lead to greater P runoff risk and possibly increase P leaching losses if soils are P saturated or if there are tile drains.

- Monitor soil test P levels over time. Manure application rates in excess of 4,000 gallons per acre per year to hay stands will likely result in a P level in excess of crop removal of P.

6. Forage Quality

- Check manured fields for forage K content if you intend to feed the forage to nonlactating cows. It's recommended to feed only the forage that has less than 2.5% K on a DM basis to these animals.

- Manure contamination at harvest will likely cause poor silage fermentation in alfalfa put up for silage rather than baled.

7. Pathogens (Johne's)

- Application of manure from animals infected with pathogens, particularly Johne's disease, can potentially spread these infections.

In the case of Johne's, animals younger than a year should not have access to contaminated pastures or to feed from these fields.

8. Odor

- From a water quality standpoint, summer application of manure to sods has advantages. But if you follow that practice, it's important to take steps to manage odors. ■