



Application of Manure to Established Alfalfa

From a nutrient use-efficiency standpoint, corn and forage grass fields tend to be the preferred fields for manure application on dairy farms. Alfalfa typically meets its nitrogen (N) requirement through biological N fixation so N from other sources is unnecessary if conditions for N fixation are good. However, nutrient management plans in many dairy regions of the US including New York State require manure application to corn and forage grasses be limited to crop N needs, increasing the likelihood that manure will need to be applied to alfalfa fields. In addition, newly harvested alfalfa fields may at some times (e.g. during the summer cropping season) be the only fields accessible for manure application. The deeper rooting system of alfalfa as compared to grasses and/or corn, its high P and K demands and its ability to reduce N fixation upon availability of a readily available N form, make alfalfa a more appropriate alternative for manure application than corn or grass fields for which N needs have already been met. But, manure application to alfalfa or alfalfa/grass stands does raise questions about application rates, methods, and timing for production (both dry matter yield and forage quality), stand survival and longevity, and environmental impact.

In this fact sheet we summarize the main points of a scientific literature search we conducted on the potential agronomic and environmental benefits and disadvantages of manure application to alfalfa and mixed alfalfa-grass stands.

Nitrogen Needs and Losses?

- For established stands in New York State an average annual yield of 4.5 ton/acre is not uncommon. Given an average N concentration of 2.7% N, a 4.5 ton DM crop removes about 250 lbs N/acre annually, while a high yielding stand with a 6 ton DM /acre crop removes a little more than 300 lbs of N/acre per year. A pure alfalfa stand can obtain the N through biological N

fixation although most often, the soil supplies some of the N as well.

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



Figure 1: Established mixed alfalfa-grass stands with more than 60% grass are better alternatives for manure application than newly established monocultures of alfalfa.

- Nitrogen addition suppresses N fixation but by how much is less certain. Several studies show biological N fixation can still supply 20-25% of the total N in the crop, even when large amounts of additional N are applied. Because of this, manure application rates should not exceed the equivalent of 75-85% of N removed in harvest to minimize annual manure N leaching losses.
- Surface application of manure can lead to N losses through volatilization. In addition to runoff and volatilization, direct flow of manure to subsurface drains can cause significant N loss and environmental concerns. It is recommended to monitor tile

drain outlets when applying liquid manure in tilled fields as deep cracks in the soil, root channels, and earthworm burrows, promote preferential flow of manure to tile drains, especially when applying liquid manure (versus semi-solid manure) when soils are on the wet side.

- The practice of applying manure shortly before plow-down and rotation to corn is a common and convenient method of manure application, since alfalfa injury is not a concern, and sod fields are often more trafficable when soil conditions are wet. However, except at low rates, this practice should be discouraged because first year corn can get all of its N needs from the plowed sod and too much extra N from manure can lead to an increased risk of N leaching.

Weed Pressure

- Weed pressure tends to increase with soil fertility levels and producers need to be prepared to handle the extra weed pressure with herbicides or timely clippings of manured fields. However, weed pressure is generally a concern in the establishment year only.

Compaction

- When manure is applied to established stands, a combination of high soil moisture levels and heavy application equipment can result in severe compaction with up to 100% plant mortality in the compacted areas.
- Wheel traffic damage can be minimized by planting traffic tolerant varieties, using small tractors for cutting, raking and harvest, avoiding unnecessary trips across the field, using larger harvesting equipment, avoiding tractors with dual wheels, and driving on fields as soon after cutting as possible.

Burn, Smothering and/or Salt Injury

- Delaying manure application after harvest increases burn risk and salt injury as new leaves are most sensitive to ammonium and salts in the manure.
- To reduce the risk of burn, smothering and/or salt injury to the established stand, liquid manure application rates should not exceed 4,000 gallons/acre per application.
- Application of semi-solid manure is not recommended but where done, should be limited to no more than 10 tons/acre.

Phosphorus Accumulation and Loss

- An average alfalfa-grass stand removes about 13 lbs of P_2O_5 per ton DM. Repeated phosphorus applications in excess of crop removal will result in soil test P increases. This will lead to greater P runoff risk over time and may increase P leaching concerns if tile drains are present.
- Soil test P levels should be monitored over time as manure application rates in excess of 4,000 gallons/acre per year will likely result in a P application that exceeds P crop removal.

Forage Quality

- Manured fields should be checked for forage K content if the forage is being fed to non-lactating cows. It is recommended to only feed forage with less than 2.5% K (DM basis) to non-lactating cows.
- Special consideration should be made if alfalfa is to be put up for silage rather than baled as hay as manure contamination of forage at the moment of harvest will likely result in poor silage fermentation.

Pathogens (Johne's)

- Application of manure from animals infected with pathogens, particularly Johne's disease is a potential method of spreading these infections. In the case of Johne's disease, young animals (<1 year) should not have access to contaminated pastures or to feed from these fields.

Odor

- Although from a water quality point of view, summer application of manure has great advantages, odor control measures should be implemented when manure is being applied to sods in the summer months.

For more information



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2006