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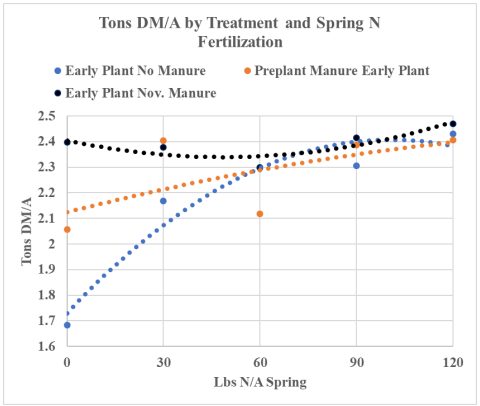
"It is the crops that feed the cows that make the milk which creates the money."

Advanced Ag Systems
Research, Education, Consulting

Manure for Fertilizer on Winter Forage, Part II

For optimum results winter forage needs to be planted as soon as the corn is chopped off. Research in the August 2018 newsletter showed the advantage of fall manure before planting. Our research found (graph at right) incorporated pre-plant fall manure for winter forage may meet the spring nitrogen needs for yield, but **NOT** meet our forage crude protein goal of >18%. This is a problem as the field crew is busy chopping while you are trying to get the manure on, incorporated, and the winter forage planted. The other problem of trying to meet all the nitrogen needs by applying manure at planting, is the sheer amount of nitrogen this crop can remove.



New York Farm Viability Institute supported a continuation of the above research with an important change. **Applying manure by injection after the soil temperature has fallen below 50 degrees can store the ammonia that is in the manure until spring when it is used by the winter forage for spring growth.**

Utilizing an innovative manure injector (Bazookafarmstar.com) arranged by Ken Van Slyke (1-585-739-3761) with an angled wavy coulter opener (photos on this page – I have no financial arrangement with either company or individual), and the help of Brian Chittenden of Dutch Hollow Farm, we injected 8,000 gal of liquid manure into the winter forage the Monday before Thanksgiving (11/20/17). At this late date soil temperature is cold enough that the ammonia the manure contains is held safely in that form until spring. When the soil warms again, the winter forage is already growing and will quickly capture any nitrate from the converted ammonia. If you use a knife to inject, there is smearing of the side walls which inhibits absorption, and is much more likely to bring up stones. Smooth coulters also smear the side walls. This unit's angled wavy coulter lifted the sod with minimal smearing, injected the manure, and laid the winter forage sod back down on top of it. In one test we applied 14,000 gal/a into a harvested corn silage field of heavy, silty clay loam. The next morning the slot only had slight manure residue as the liquid rapidly absorbed into the undisturbed side walls of the trench. The closing coulters did not push the winter forage sod flat. I would suggest you remove them and simply wait 24 hours for it to absorb, then quickly and efficiently run a roller over the field (adding a regular roller on the unit adds weight and squishes the manure out of the slot). Where the lifted sod was not packed back down, the triticale on that strip next spring was lighter green and much shorter as the roots were not able to re-establish across the air space. Even without full slot closure, there was little to no odor directly down wind. Another advantage of this system is that it can meet the spring nitrogen needs of the winter forage through environmentally sound

Brian Chittenden of Dutch Hollow farm with the Bazooka injector applied manure to an established winter forage crop in November.

applications in November and into December (or until the ground freezes) which are normally less hectic times for cropping on dairy farms. Note: **top-dressing unseparated manure on tall winter forage is a prescription for potential disaster**. The manure will stay lodged in the forage crowns making **unfeedable silage** the next spring, and wastes most of the nitrogen in the manure through volatilization. Thus, our interest in this new manure injector.

The coulter/injector handled a heavy winter forage sod, injecting 8,000 gal manure/acre.

In this study for select plots we immediately incorporated 8,000 gal of manure plus nitrification inhibitor before planting. Using the injector, another 8,000 gal/acre (no inhibitor) was injected into select plots of growing winter triticale the 20Th of November when the soil was cold. **Note**: yields on this trial were limited to 2.5-ton DM/A due to the ancient planter we used. In the same field another trial with the same variety planted with a modern planter yielded 3.78 tons of DM/A (10.8 tons of silage). Adding insult to injury, the early planting was set back by 90 F, July weather the last two weeks of September (too hot to grow). This resulted in dramatically reduced fall growth. The following spring, we applied 0, 30, 60, 90, 120 lbs. of nitrogen/acre (urea + volatilization inhibitor) to replicated (4) plots for each treatment. Non-manured plots also got additional sulfur (manure has sulfur).

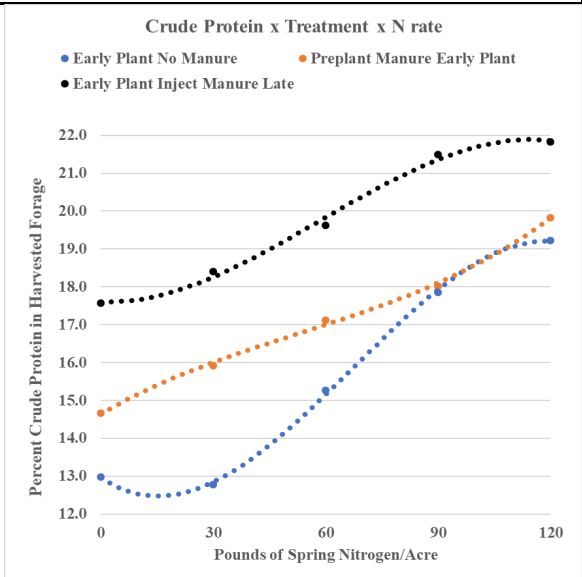
Table #1 Yield: Tons DM/A by Plant Date x Manure x Spring Nitrogen

Plant date	Early				Late
Manure	None	At Planting	November	At Planting & November	November
Spring N/A 0	1.68 b	2.06 a	2.40 a	2.34 ab	1.69 a
30	2.17 a	2.41 a	2.38 a	2.45 a	1.89 a
60	2.30 a	2.12 a	2.30 a	2.04 b	1.84 a
90	2.31 a	2.39 a	2.42 a	2.32 ab	1.87 a
120	2.43 a	2.41 a	2.47 a	2.36 ab	1.87 a
Data with same letter is not significantly different @95%					
MEAN	2.18 b	2.28 ab	2.39 a	2.30 ab	1.83 c

Table #2 Percent Crude Protein by Plant Date x Manure x Spring Nitrogen

Plant date	Early				Late
Manure	None	At Planting	November	At Planting & November	November
Spring N/A 0	13.0 c	14.7 c	17.6 b	17.2 b	15.8 b
30	12.8 c	15.9 bc	18.4 b	19.4 ab	18.3 ab
60	15.3 b	17.1 b	19.6 ab	19.1 ab	18.9 ab
90	17.9 a	18.0 ab	21.5 a	19.5 ab	20.4 a
120	19.2 a	19.8 a	21.8 a	20.4 a	21.2 a
Data with same letter is not significantly different @95%					
MEAN	15.6 b	17.1 b	19.8 a	19.1 a	18.9 a

What we found (Data in tables): For non-manured planted on time plots (Early, None, in table), 30 lbs. N/a spring nitrogen was needed for yield (Table #1). For crude protein (Table #2), 90 lbs. N/a was significantly higher. Manure incorporated before planting on time (Early, At Planting) met all the nitrogen needs for yield the next spring; while 90 lbs. N/a was best for crude protein production. Planting early with manure sidedressed in November (Early, November) gave us the **highest yields and all crude protein was over 17%** (see graph at right for Crude Protein), although it increases with 60 lbs. of spring nitrogen. Applying manure before planting and then again in November (At Planting & November), met all the nitrogen needs for yield (except for 60 lbs.N/a which had a fluke low yield affecting the data). Again, all crude protein was above 17% although significant increases were obtained by adding another 30 lbs of N/acre in spring. **Planting Late (October 5)** and then sidedressing manure in November met all the spring nitrogen needs for this **23% lower yielding crop.** It responded to an additional 30 pounds of N/A for raising crude protein in the spring.



Observations: Where manure was applied before on-time planting, it significantly raises the following spring's yield in multiple research years. The problem is finding the time to do it. The impact was muted in this study by the hot September conditions stopping growth, and the planter issues. If you choose to apply more than 4,000 gal/a of manure before planting (more nitrogen than the crop can absorb), I highly suggest using a **nitrification inhibitor** to hold the nitrogen not absorbed in the plant in the safer ammonia form until the soil cools so it is available next spring (this still may not be sufficient and you will have nitrate losses before the soil turns cold). The most practical system for most farms appears to be planting the winter forage as quickly as possible after corn silage harvest. **Getting the winter forage in the ground** on time through minimum or no-till may be **more critical than applying manure** as it maximizes both fall tillering and absorption of leftover soil nitrogen. Most corn has manure heavily applied and the left over nitrogen can support the fall tillering necessary for high spring yields. After the harvest rush is over, depending on the farm location, **some time in November or December manure can be injected** into the winter forage sod to meet all the needs of the crop and produce high protein in the forage next spring. Where we applied manure both before planting and injected late, we had more nitrogen to work with which minimized the impact on yield and crude protein from spring fertilizer nitrogen. Unfortunately, this means two trips over the field. Applying injected manure to even late planted material was very successful although the amounts to apply can be reduced some due to the significant reduction in yield potential.

I have two concerns with this study. First, is that the manure rates we used are judged on the equipment/environmental issues under limited yield in this trial. The trial next to it that did not have the equipment issues yielded **3.78 tons of dry** matter @19% crude protein which **removed 230 lbs. of nitrogen/acre**. Thus our manure rates for a properly planted and growing crop may be to low for both yield and especially quality. Much higher November injected manure rates appear to be needed but this may be biased as can be seen where we applied manure preplant and in November. The concern is that **this year's manure may not have released normally due to the very cold March and April with a very late spring warmth.** The soil did not warm until the last three weeks before harvest. I have little worry about leftover manure nitrogen after winter forage harvest as most farms are strip tilling corn into the stubble immediately after. Without sufficient left over nitrogen, pop up nitrogen sources are needed for rapid early corn growth.

My final observation is that the injector was on 18 inch centers. Moving closer to 15 inch centers will give much more uniform application (we did NOT see any streaking from lack of N in spring) and allow you to come back with alternate units closed for 30 inch center injected manure for the following corn crop.

Sincerely,

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