Mushroom Compost and Forage Production

By William Boone – Manager of Forage Variety Trials at Penn State

Mushroom compost (MC) has been increasingly gaining traction as a sustainable agronomic tool because it not only serves as a valuable source of organic nutrients, it works as a soil amendment as well. It is understood that MC can reduce the need for non-organic fertilizers, improve soil structure, improve the water holding capacity of the soil and possibly eliminate the need for liming.

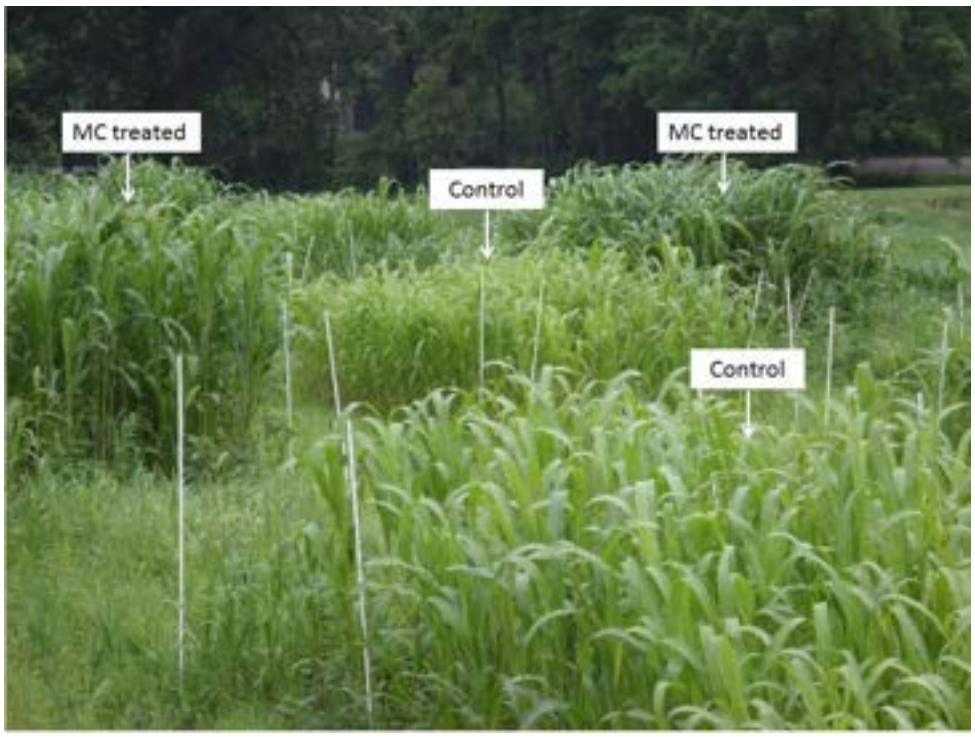
Pennsylvania farmers dedicated nearly 1.5 million acres to hay (baled and silage) production in 2014. Based on the importance of forages to the PA agricultural economy as well as the abundance of MC produced in PA, this study was implemented to determine how MC can be used in forage production to potentially decrease synthetic fertilizer usage, maintain or increase yields and improve soil quality over time.

Spring Application (40 tons of MC per acre)

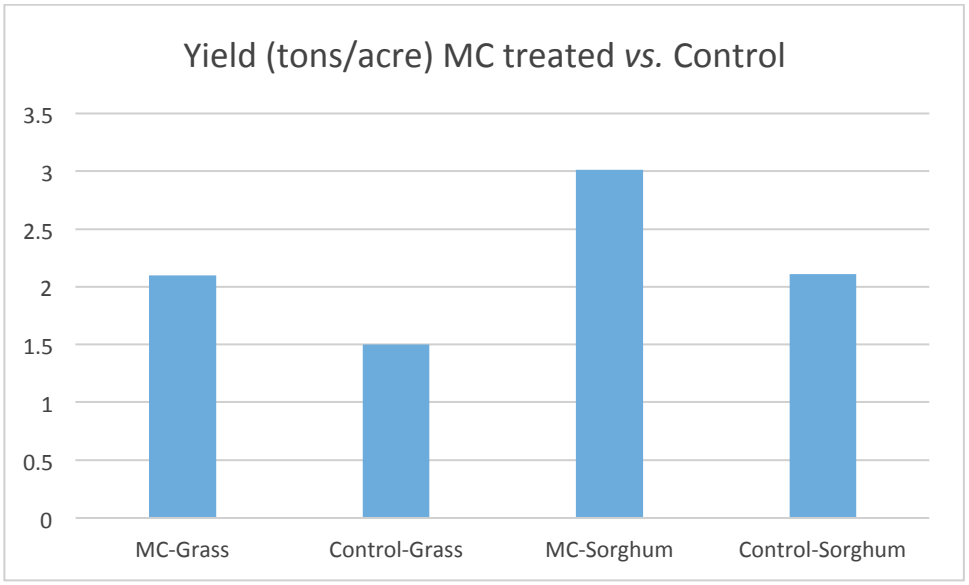
Soil samples were taken from each treatment block previous to MC application. MC was then applied at a rate of 40 tons per acre (1 inch thick application of MC). Four blocks were left untreated (no MC) to be used as control blocks. Previous work done at Penn State University by Dr. Mike Fidanza and Dr. David Beyer showed that MC applied at this rate should deliver 29 lbs. of immediately available nitrogen in the form of ammonium nitrate and another 86-192 lbs. of nitrogen as it becomes available from the organic pool. This will be released slowly throughout the growing season. The amounts of phosphate and potash at this rate of application would be 531 lbs. and 988 lbs. respectively.

After applying the MC it was worked into the ground using a culti-mulcher.

The MC was applied in 5’ strips. A 5’ Great Plains drill was used to plant a commercially available perennial grass mix and sorghum sudangrass for this experiment. (Planted May 1st, 2015)



The photo above clearly demonstrates the significant difference between two of the sorghum control blocks and the MC treated sorghum blocks nearby. The MC blocks are nearly 2' taller and a much darker green.



June 7th 2015 Harvest

The MC treated blocks outperformed the untreated controls. The chart above shows in tons per acre how the forages performed. The MC treated grasses yielded 2.1 tons per acres, while the untreated

grass controls yielded 1.5 tons per acre. The MC treated sorghum yielded 3.0 tons per acre while the untreated yielded 2.1 tons per acre. The results from the first cut of the forages are not really a surprise as we are comparing blocks with zero fertilizer to blocks with 40 tons per acre of MC. However, it demonstrates the performance value of the MC very nicely. Different rates of MC and their performance will be compared in the next phase of the study.

Phase 2. Following the first cutting the blocks were top-dressed with MC at different rates. The photo above shows the trial with MC treatments. In the forefront of the photo is an untreated sorghum and grass block that will now become a fertilized "control."

The treatments are as follows:

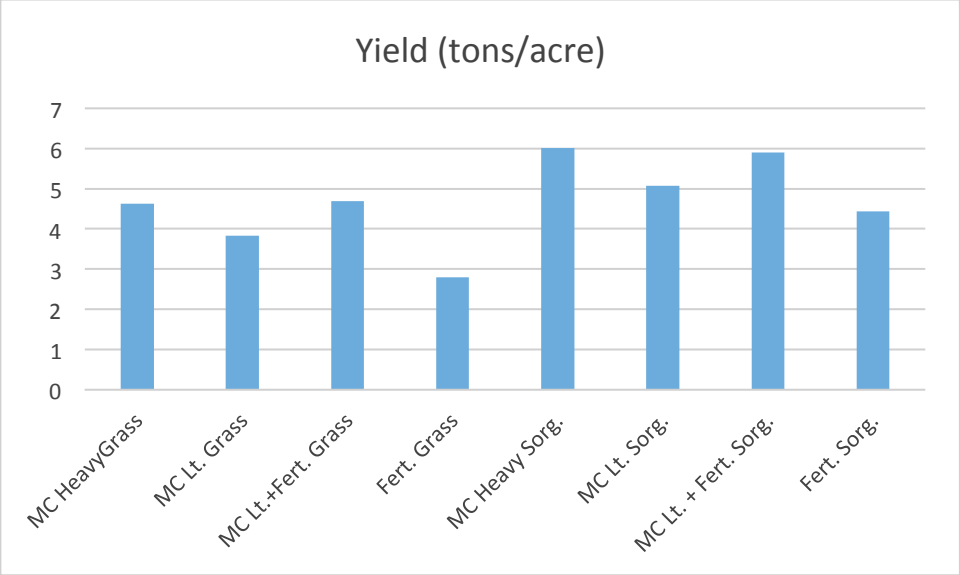
1. Heavy MC application (40 tons per acre)
2. Light MC application (20 tons per acre)
3. Light MC application + ½ rate fertilizer (20 tons MC + 40 lbs. 20-10-10 per acre)
4. Fertilizer (80 lbs. 20-10-10 per acre)

Close-up of a Heavy MC top-dress

1” thick MC on perennial grass

The graph below shows the results from the second cutting. Both forages, the grass and the sorghum show a similar pattern in response to the treatments. The heavy MC treatment yielded the most followed by the light MC + fertilizer, the light MC yielded the third best and just fertilizer yielded the least.

There are some factors that could influence these results that merit discussion. The control that was never treated with MC started off with a disadvantage. It may have subsequently developed a smaller root system or not had as strong of a start as the MC treated blocks. However, the weeks leading up to the August 21st harvest were extremely dry. The ability of MC to increase the water holding capacity of the soil may have very well played a part in the increased yield seen across the board in the MC treated blocks. The original soil tests came with fertilizer recommendations of 150-200 lbs. of N to be divided throughout the season after cuts. The forage yields seen in this trial compare well with the results of other forage trials that are receiving 40-50 lbs. of N after each cutting.



August 21st 2015 Harvest (2nd cut of season)

This applied look at MC and forage production offers an example of some of the ways it could be incorporated into the agronomic plan of a farming system. The future of this study is to continue treating the perenninal grass blocks with MC next growing season. Further soil tests will be performed to allow us to see how the soil nutrient content is being altered over time. Since sorghum is an annual, it may be interesting to replace the sorghum blocks with a crop like alfalfa which has very high potash requirements. Because there is a good amount of MC on the surface of the ground from the previous top-dress, it was decided to not apply MC again this season. We will be taking a third cut in a few weeks and those results along with soil tests will be included in future reports.

Special Thanks!

I would like to thank the American Mushroom Institute for funding this project. Thank you to Sara Manning for keeping tha ball rolling. Thank you to Eugene Richard for meeting with me to discuss the project and Don Needham and Hy-tech for supplying some of the MC needed. Also, the Agronomy Farm group at PSU helped out in too many ways to mention; thanks Scott Harkcom, the farm manager. Also, thanks to John Pecchia and the Mushroom Research Center group for their support.