



Mississippi Corn Promotion Board 2015 Progress Report

Project Title: Winter Cover Crops and Fall Applied Poultry Litter Effects on Corn Yield, Nutrient Cycling, and Soil Health Indicators

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Project Summary (Issue/Response)

Finding viable options for growers to best utilize resources available in Mississippi to improve soil health and productivity is critical to maintaining profitability. Cover crops, especially legumes, and poultry litter are resources which can fit in Mississippi production systems and can provide soil health benefits including nutrients such as N. Cover crops were successfully seeded with a Great Plains drill on 21 Oct. 2014 into corn residues. Cover crop treatments included winter fallow, hairy vetch (HV) at 30 lb/acre, rye at 60 lb/acre, and a 50/50 blend of HV-rye at 50 lb/acre were planted. On 21 Nov. 2014, pelletized poultry litter (PL) (Mighty-Grow 3-3-3) at a rate of 2000 lb/acre was broadcast applied to plots with and without all cover crop combinations. Non-litter treated plots received fertilizer P and K rates equivalent to that supplied by the PL. As a comparison to typical fertilizer N response, liquid UAN 32% treated plots at rates of 0, 50, 100, 150, and 200 lb N/acre were included. Treatments were arranged as a randomized complete block design with four replications with the experimental site located at the W.B. Andrews Agricultural Systems Research Farm Mississippi State, MS. Cover crops were harvested for biomass and N production on 9 April, 2015 and sprayed with glyphosate to terminate growth. Corn variety Pioneer 1637YHR was planted at 30,000 kernels/acre on 22 April, 2015 in plots 4 rows wide (38 in. spacing) and 40 ft long. To determine total N content of the corn, a 39.4 in. length of whole corn plants was sampled on 10 Aug. 2015. Corn for grain was harvested 28 Aug. 2015 with a 2-row Kincaid automated combine.

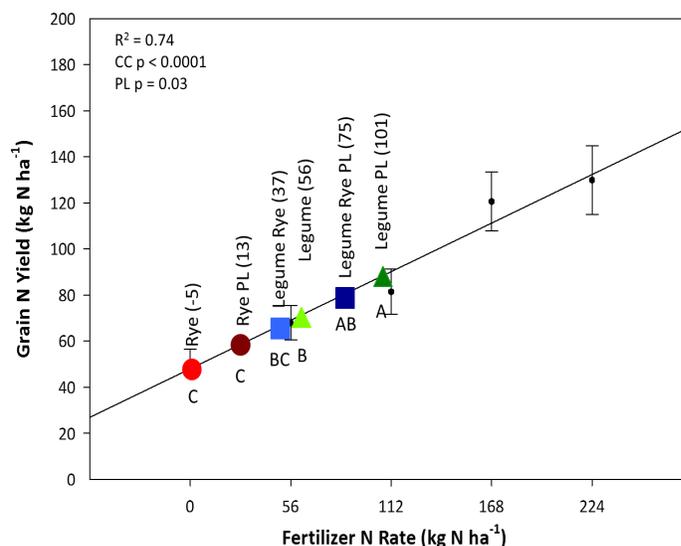


Project Results/Outcomes

Total N contents for aboveground biomass produced by cover crops were HV 50 lb/acre, HV-PL 71 lb/acre, Rye 26, Rye-PL 32 lb/acre, HV-Rye 47 lb/acre, and HV-Rye-PL 56 lb/acre. Based on corn grain N response to fertilizer N rates alone, fertilizer N equivalency values based on grain N content of cover crop/poultry litter combinations were HV-PL 90 lb/acre, HV-Rye-PL 75 lb/acre, HV 50 lb/acre, HV-Rye 33 lb/acre, Rye-PL 11 lb/acre, PL 3.5 lb/acre, and Rye -4.3 lb/acre. Soil cores 2 in. diameter X 12" length were taken with a Giddings tractor mounted hydraulic soil probe in the fall. Cores were contained in aluminum pipe for depths 0 to 2", 2 to 4", 4 to 6", and 6 to 12" depths and from either within the row/strip till area or in the middles or non-strip tilled area. Following three years of treatments, little difference in bulk density values of the soil due to treatments was found. The main difference observed was lower bulk density values within the tilled strip down to a depth of 6" as compared to the non-strip tilled middles. Bulk density values were 1.31, 1.48, 1.57, and 1.74 for tilled rows and 1.42, 1.69, 1.73, and 1.77 for the non-tilled middles for depths of 0 to 2", 2 to 4", 4 to 6", and 6 to 12", respectively. No consistent trend was observed for total soil C and N concentration with increasing N rates, while cover crop X poultry litter combinations generally increased both total soil C and N in the 0 to 2" depth as compared to N fertilizer treatments. All other depths are currently being analyzed for Total C and N contents. Results are demonstrating the benefits including a legume and poultry litter in a fall cover crop system. Based on yearly results

Project Results

for 2013-2015, corn yield has increased each year when hairy vetch was included and the greatest increase resulted when poultry litter was integrated as well. Either poultry litter or rye alone or combined together did not produce a consistent increase in corn yield and at times these combinations were no better than no cover crop or fall applied poultry litter. These results suggest that the N contribution from the legume cover can substitute for a portion of fertilizer N requirements and combined with poultry litter there appears to be a synergistic yield response as the added benefit from a legume cover crop and poultry litter as used alone does not equal the response when they are used simultaneously.



Cover crop/poultry litter treatment responses in 2015 at Mississippi State based on equivalence to fertilizer N rates.

Project Impacts/Benefits

Results of this project are demonstrating the potential for cover crop/poultry litter systems to substitute for a portion of fertilizer N requirements in a non-irrigated strip-till systems. Soil analysis data is also showing improvement in total C and N contents which serve as indicators of improving soil health. The use of a legume cover crop such as hairy vetch as well as poultry litter suggests the importance of providing a C source for soil microbes to flourish on as opposed to strictly only using commercial fertilizers which generally lack C substrates. The impact of these results can be far reaching as growers adopt greater use of cover crops and poultry litter to improve soil health and productivity.

Project Deliverables

Varco, J. J. 2015. Soil Health and Productivity. Mississippi Fruit and Vegetable Growers Association Conference and Trade Show, Mississippi Fruit and Vegetable Growers Association, Natchez, MS.

Varco, J. J. 2015. Measured sustainable N benefits of fall-applied poultry litter management schemes in a corn production system. ASA-CSSA-SSSA Annual Meeting, ASA-CSSA-SSSA, Minneapolis, MN.

Varco, J. J. 2015. Cover Crops. MACA 42nd Annual Conference, MACA, Mississippi