Application of Manure/Compost on Alfalfa

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INTRODUCTION

The application of manure to agricultural fields has always been promoted to help increase soil organic matter, improve soil structure and add a "natural" source of nitrogen to crops. Recent rules concerning the handling of animal waste have made this practice a bit more more complicated. With the implementation of the National Pollutant Discharge Elimination System (NPDES), animal waste can only be applied in the amount that the crop and soil can hold. Therefore, a balance must be maintained between what is being applied and what is being removed with harvest. Nationally, this balance could be done for either nitrogen or phosphorus, balancing what was applied with the manure waste with what the plant used and the soil could hold. In Arizona, it was determined that nitrogen would be the limiting nutrient since problems with phosphorus (runoff due to rain and pollution of surface waters) was not a great concern.

Objective: To assessing the impact on crop yield and the soil environment of applying dairy manure and compost on an irrigated alfalfa.

METHODOLOGY

Three treatments were setup, a zero nitrogen (1), a manure (2) and a composted manure (3). Each treatment was replicated 4 times in a field at the Maricopa Agricultural Center, Maricopa, AZ. The manure and compost applications were made between cuttings of alfalfa. The amount applied was equal to the amount of nitrogen removed from the cut. Thus, after each cut, a sample was taken of the alfalfa and analyzed for nitrogen content. The manure and/or compost was the applied in an amount approximately equal to the amount of nitrogen removed.

Figure 1. After cutting, a 2 m sample was taken from the windrow, weighed and analyzed for nitrogen content.

Once the amount of manure/compost to be applied was determined, the spreader was fill, weighed and the manure/compost applied to the field. After the application, the field was irrigated. This was done for each cut,attempting to apply the manure/compost in an amount so that the N applied equaled the N removed.

Figure 2a, b and c. The manure being loaded, weighed and then spread onto the research plots.

RESULTS –Yield

The graphs below show the results of the yield data (Fig. 3) and the analyses of the harvested alfalfa (Fig. 4). Although there were variations in cuts, overall, there were no significant differences in the yield or nitrogen content between the three treatments.

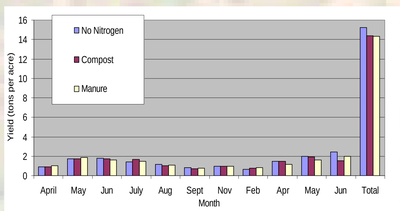

Figure 3. Yield data for the three treatments.

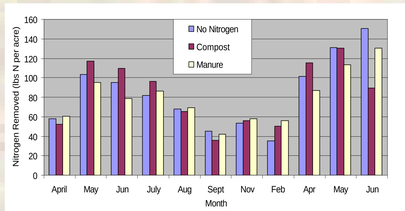

Figure 4. Total nitrogen removed with harvest.

RESULTS –Manure/Compost

The composition of the manure and compost change from month to month. Overall, the manure had higher ammonium concentrations (Fig. 5) and the compost had higher nitrate concentrations (Fig. 6). Total nitrogen (Fig.7) between the two was almost identical and varied little.

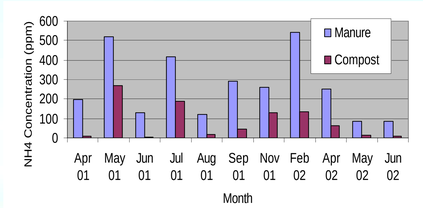

Figure 5. Ammonium concentrations in manure and compost.

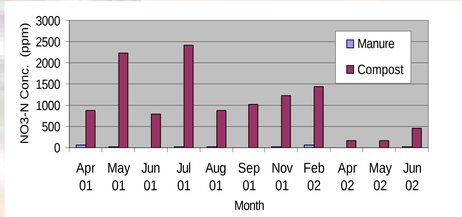

Figure 6. Nitrate concentration in the manure and compost.

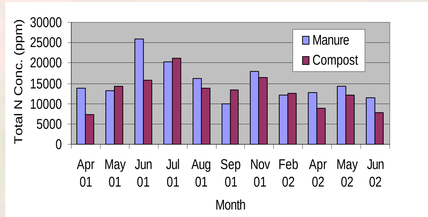

Figure 7. Total nitrogen in the manure and compost.

RESULTS –Soil

Soil test were performed before, during and after the study was completed. Figure 8 shows the increase in phosphorus associated with both the compost and manure applications. In Figure 9, the nitrate is actually lowered during the mid-season and increased slightly at the end for all of the treatments. The ammonium content (Fig. 10) follows a similar pattern to the nitrates, although the actual amount (lbs./acre) is much less.

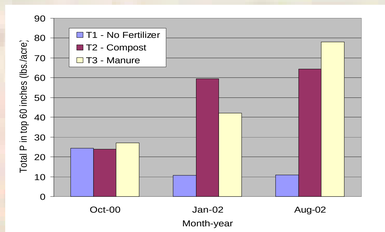

Figure 8. Total P in the top 60 inches of soil.

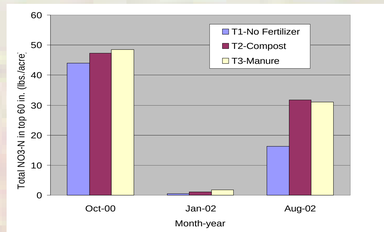

Figure 9. Total NO3-N in the top 60 in. of soil.

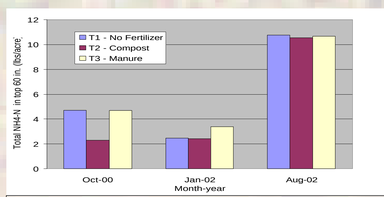

Figure 10. Total NH4-N in the top 60 inches of soil.