Title

Developing an Efficient Cover Cropping System for Maximum Nitrogen Recovery in Massachusetts

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Abstract

Time of planting plays a critical role in nitrogen (N) uptake by rye cover crop (CC). Even a few days of delay in planting can severely decrease CC performance. Evaluating the amount of N accumulation related to time of planting is critical to the farmer who has to optimize the winter rye planting date based on completion of corn harvest, suitable weather conditions and time availability for fall manure application. Winter rye cover crop was planted at 6 planting dates in fall from mid August to early October at weekly intervals from 2004 to 2009.

The results suggest that delay from critical planting date (CPD) will decrease rye N uptake dramatically. Suggested CPDs for northwest parts of Massachusetts are not applicable because they are too early (third to fourth week of August). CPDs for central parts of the State are from first to second week of September. Farmers in these zones can take advantage of cover crop by a better time management and planting no later than vii CPD. In Eastern areas of Massachusetts CPD is the third week of September. By evaluating the effect of planting date on rye growth and N accumulation throughout the State, this model provides a powerful decision making tool for increasing N recovery and reducing nutrient leaching.

Sixteen units of cost effective and accurate automated lysimeters were designed and installed to measure post-harvest nitrate leaching from a rye cover crop field during the falls and winters of 2007 to 2009. The electronic system was designed to monitor soil tension and apply the equal amount of suction to the sampling media. Hourly data from soil tension and vacuum applied to the system were collected and stored by each unit. A safety system was designed for protecting vacuum pump against unexpected major vacuum leakage events. The controller can be easily reprogrammed for different performance strategies. Other major parts of lysimeter included the power supply systems, vacuum pump, vacuum tanks, sampling jars, suction cups and plates, and electronic valves. The electronic system showed a very reliable and accurate performance in the field condition.

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