AN ENVIRONMENTAL ASSESSMENT OF SENSOR-BASED VARIABLE-RATE NITROGEN MANAGEMENT IN CORN

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ABSTRACT

Nitrogen (N) fertilizer unused by the crop is left to the fate of the processes of the N cycle, and can eventually lead to nitrate contamination of surface and ground waters. In order to address this problem, various methods have been used to try to account for spatial variability of N within agricultural fields. One approach to account for this variability and thereby reduce nitrate pollution is in-season site-specific N application according to economic optimal N rate (EONR). Recently, active-light reflectance sensors have been tested for mid-season, on-the-go N fertilizer application in corn. This 2004 and 2005 study was conducted on 12 Missouri producer corn fields to (1) evaluate the relationship between EONR and active-light reflectance sensor readings, and (2) evaluate the relationship between environmental measurements and EONR. Measurements included EONR, crop N yield efficiency (YE), N fertilizer recovery efficiency (NFRE), and post-harvest soil inorganic N levels. In 2004, EONR was significantly related to active-light sensor indices, but with regression model coefficients of determination (r^2) ≤ 0.35 for all sensor indices evaluated. Prediction of EONR improved ($r^2 = 0.47$) when soil electrical conductivity was added to the model. A relationship between EONR and the indices could not be established for 2005 data. In 2004, YE at EONR was not the same between fields, and ranged from 19-47 kg grain $(kg\ N)^{-1}$. As N rate approached EONR, both YE and NFRE declined, while post-harvest inorganic N levels increased. These preliminary results show promise for using active-light reflectance sensors to achieve EONR and reduce N loss off fields.