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# Pooled Analysis of Combined Primary Data across Multiple States and Investigators for the Development of a NDVI-Based On-the-Go Nitrogen Application Algorithm for Cotton

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Abstract. Nitrogen (N) use efficiency has been an important issue to farmers and researchers for at least three decades. Profit-maximizing farmers apply N fertilizer up to the point of yield optimization; thus, by virtue of being rational decision makers, they do not intentionally over apply inputs. Over-application of N fertilizer has been suspected of contributing to environmental problems. Environmental stewardship and on-farm profitability can simultaneously be improved by optimum site-specific application rates of N; and one solution to this problem is automation of the decision-making process of choosing optimal site-specific application rates. Coordinated multi-state research on cotton lint yield response to N application rates with canopy reflectance measured as normalized difference vegetative index (NDVI) over a range of time periods was conducted from 2004 to 2012. State-level algorithms have been developed from individual field studies; however this prospectively planned study assimilated existing field studies into an aggregated data set suitable for data mining. Aggregate data analyses empower researchers to explore and discover new practices that may have been unattainable via individual analyses of field studies. The overall research objective was to develop NDVI-based on-the-go N fertilizer application algorithms for cotton. Research goals were achieved by analyzing data from this sequentially designed multi-state experiment that followed similar protocols to establish relationships between reflectance data and cotton lint yield as part of the process of using these sensors for on-the-go N management.  We use a N deficiency method to estimate N recommendation multipliers for calibration of a global algorithm allowing region-specific parameters.

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