EVALUATION OF VARIABLE RATE SEEDING IN COTTON

Michael T. Plumblee
Kendall R. Kirk
Tyler S. Soignier
Clemson University
Blackville, SC

Abstract

Over the last decade, the adoption and availability of planter technologies have increased across farms in the Southeastern United States providing growers the ability to precisely place seed in areas of the field that they desire. Furthermore, benefits of using planter technologies appear to have some benefit in other crops commonly grown in rotation with cotton such as corn and soybean. Cottonseed typically makes up 15-20% of the total input cost for cotton production. With the current price of commodities and input costs continuing to rise, annual profit margins are likely tight. For growers to remain competitive and profitable, areas within their current production systems must be evaluated to determine costs that can be reduced. Previous research by Gwathmey *et al.* (2010) demonstrated that cotton lint yield could be maintained at plant populations as low as 30,000 plants per acre. Therefore, the objective of this research was to determine if variable rate seeding in cotton could reduce seed cost while maintaining lint yield.

An experiment was conducted in 2017 and 2019 at the Edisto Research and Education Center in Blackville, SC to evaluate variable rate seeding in cotton and to test the Directed Rx variable rate prescription development method. Electrical conductivity (EC) data was collected prior to planting with a Veris 3100 EC cart. In 2017 and 2019 Deltapine 1646 B2XF was planted in 4-row strip plots at 6 uniform seeding rates in an irrigated field. Each treatment was replicated six times across the field in a randomized complete block design. Uniform seeding rates consisted of: 50,966, 67,955, 84,941, 101,929, 118,918, and 135, 907 seed per hectare. All treatments were planted with a 4-row John Deere 1700 planter with Precision Planting vDrive, vSet2, and singulated cotton seed disks. Yield was collected using a John Deere 9996 cotton picker with a yield monitor. Data collected in 2017 allowed for variable rate prescriptions to be created using the Clemson Directed Rx method and this variable rate prescription was applied in strips in 2019 for comparison purposes. Data were subjected to analysis of variance using the PROC Glimmix procedure in SAS 9.4 and multiple pairwise t-tests were used to separate means at $p = 0.05$.

When evaluating variable rate prescriptions, regardless of product, zone delineation is one of the most crucial factors in how the prescription preforms. Though several options exist for developing management zones for variable rate applications (shallow EC, deep EC, historical yield data), the 2017 variable rate prescription applied in 2019 was based on shallow EC. From the 2019 data, the 118,918 seed per hectare uniform seeding rate provided the greatest return above seed cost compared to other uniform rates. When comparing seed costs, the 2017 variable rate prescription had significantly less cost than that for the most profitable uniform rate. Furthermore, the projected profit for applying the 2017 shallow EC variable rate prescription was no different from the best performing uniform rate. When the 2017 shallow EC variable rate prescription was actually applied in 2019, no difference was observed in the projected and actual profit. Variable rate seeding in cotton did however show the potential to profit $34 per hectare over any other uniform seeding rate, had the correct prescription been applied. The overall response and benefit of variable rate seeding in cotton likely varies on a field-by-field basis regarding the soil texture variability that exists within the field. From this research the Clemson Directed Rx method appears to be an appropriate, repeatable, method to develop variable rate seeding prescriptions. Continued research on how to define zones by field activity (planting, fertilizing, by crop, etc.) is needed to repeatedly maximize profit with variable rate.