RESULTS FROM THE 2010 TEXAS AGRILIFE EXTENSION SERVICE HIGH PLAINS AND PANHANDLE DEEP SOIL SAMPLING PROJECT

Chris Ashbrook
Mark Kelley
Randy Boman
Texas AgriLife Extension Service
Lubbock, TX
Galen Chandler
Brent Bean
Rex Brandon
Texas AgriLife Extension Service
Amarillo, TX

Abstract

Because of higher fertilizer prices, need for deep soil sampling to assess residual NO_3-N has increased. Deep sampling conducted in 11 High Plains producer fields in 2008 found 73, 64, and 52 lb NO_3-N/acre in the 0 to 24-inch depth in center pivot, furrow, and sub-surface drip irrigated fields, respectively. Previously, soil samples taken at the 0 to 6-inch depths could generally be easily acquired with a shovel or hand probe. However, soil sampling to depths up to 24 inches most often requires a hydraulic sampler. With this in mind, in 2009 a device was designed and fabricated by Texas AgriLife Extension Service personnel at the Texas AgriLife Research and Extension Center at Lubbock. In 2010 this device was used to deep sample a total of 113 producer fields in the Panhandle and Southern High Plains. These included 17 dryland and 96 irrigated fields. Of the 96 irrigated fields, a total of 6 furrow, 29 sub-surface drip (SDI), 36 low-energy precision application (LEPA), and 25 low-elevation spray application (LESA) fields were sampled. Mean residual NO_3-N in the 0 to 24-inch depth was 43, 47, 53, 52, and 53 lbs/acre for dryland, furrow irrigated, LESA, SDI, and LEPA, respectively. Results indicate that of the fields sampled, irrigation system type generally did not affect residual NO_3-N amount. Considering the acreage sampled and the amount of residual NO_3-N, the total amount of N saved by producers could approach 350,000 lbs. If an average price of $0.40/lb N is assumed, this results in about $140,000 potential fertilizer cost savings in the sampled fields. Implementation of deep sampling for NO_3-N and adjusting on-farm fertilization should likely result in improved crop management which could include less plant growth regulator usage, better harvest aid performance, possibly reduced *Verticillium* wilt incidence, and potentially an improvement in cotton maturity.

Introduction

Necessity of soil sampling to greater depths has increased in order to better characterize residual NO_3-N available for cotton production. This was driven by increased fertilizer cost and possible negative crop maturity issues in some High Plains and Panhandle fields. Soil samples taken to the 0 to 6 inch depth can usually be acquired relatively easily with a shovel or small soil probe. However, soil sampling to depths up to 24 inches generally requires hydraulic powered samplers. With this in mind, a device was designed and fabricated by Texas AgriLife Extension Service personnel at the Texas AgriLife Research and Extension Center at Lubbock (Ashbrook et al. 2010).

Materials and Methods

In cooperation with Texas AgriLife Extension Service - Agriculture and Natural Resources agents, a total of 113 producer fields in the Texas High Plains and Panhandle regions (encompassing about 7,000 acres) were sampled in March-April, 2010. These included 17 dryland and 96 irrigated fields. Of the 96 irrigated fields, a total of 6 furrow, 29 subsurface drip (SDI), 36 low-energy precision application (LEPA), and 25 low elevation spray application (LESA) fields were sampled. Soil samples were submitted to the Texas AgriLife Extension Service Soil, Water and Forage Testing Laboratory for analyses. Results of residual NO_3-N found in the 0 to 24-inch depth were summarized by dryland and by irrigation system type.

Results and Discussion

Soil analyses indicate that from 17 sampled dryland fields, 7, 140, and 43 lbs/acre of NO_3-N were found in the 0 to 24-inch depth, for the minimum, maximum, and mean values, respectively (Figure 1). Furrow irrigated results were

24, 70, and 47 lbs/acre of NO_3-N in the 0 to 24-inch depth, for the minimum, maximum, and mean values, respectively (Figure 2). Amounts found in LESA irrigated fields were 8, 140, and 53 lbs/acre of NO_3-N in the 0 to 24-inch depth, for the minimum, maximum, and mean values, respectively (Figure 3). SDI field results were 12, 110, 52 lbs/acre of NO_3-N/acre in the 0 to 24-inch depth, for the minimum, maximum, and mean values, respectively (Figure 4). Figure 5 presents 0 to 24-inch depth data from LEPA irrigated fields and indicates that 8, 142, and 53 lbs/acre of NO_3-N were found for the minimum, maximum, and mean values, respectively.

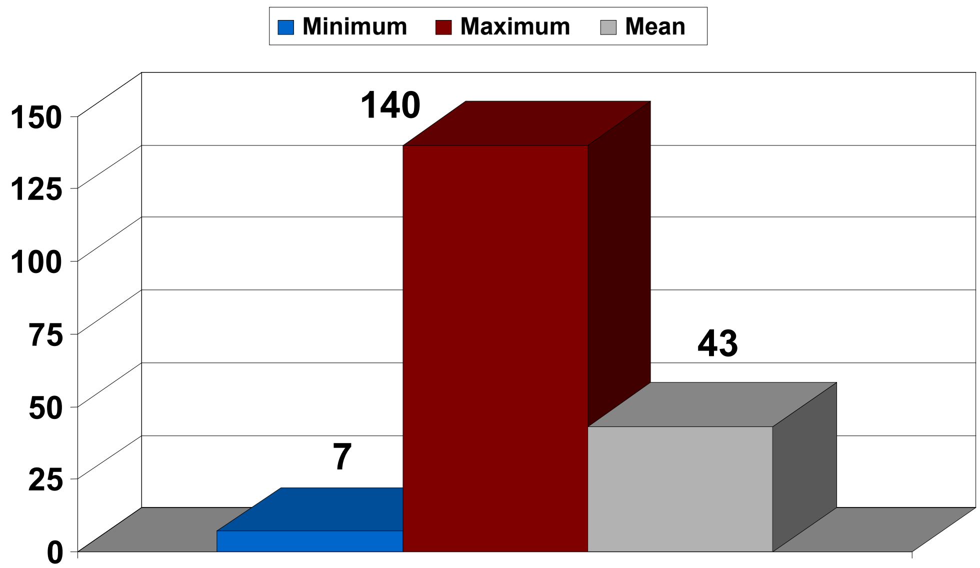

Figure 1. 0 to 24-inch NO_3-N (lbs/acre) found in 17 dryland fields.

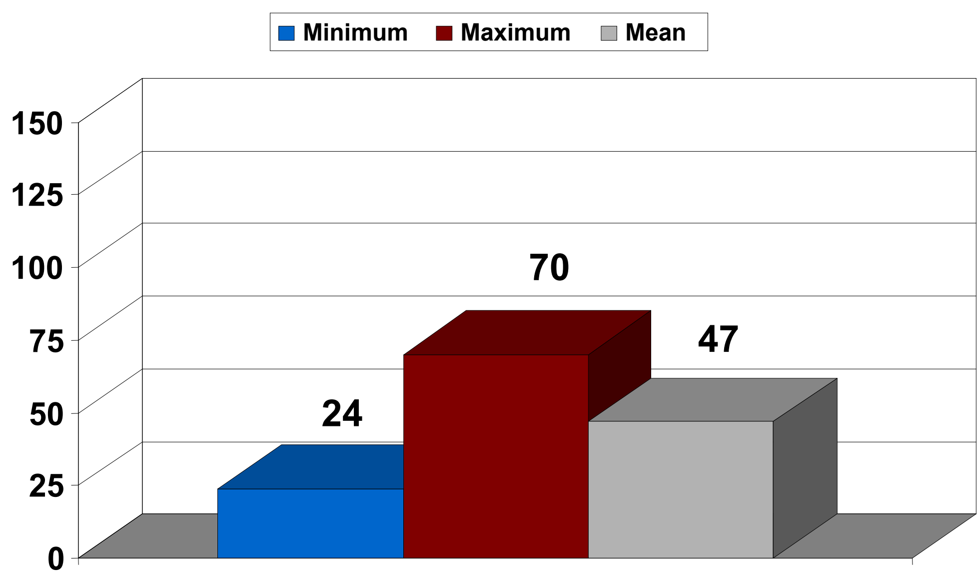

Figure 2. 0 to 24-inch NO_3-N (lbs/acre) found in 6 furrow irrigated fields.

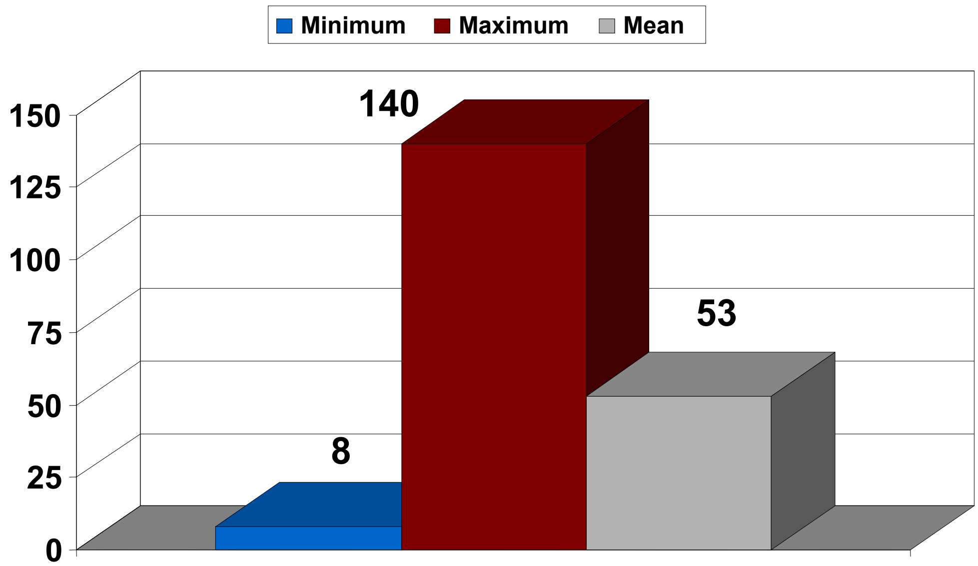

Figure 3. 0 to 24-inch NO_3-N (lbs/acre) found in 25 LESA irrigated fields.

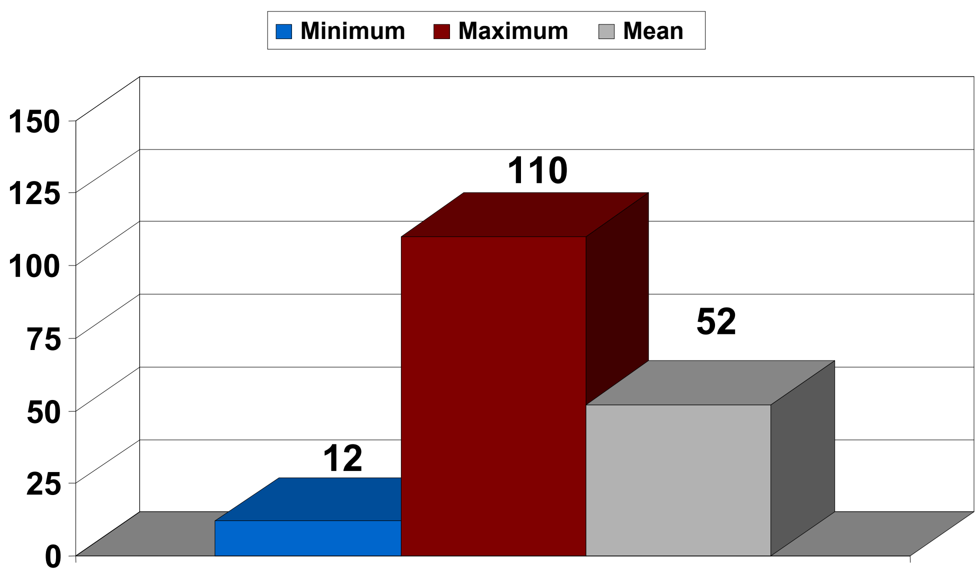

Figure 4. 0 to 24-inch NO_3-N (lbs/acre) found in 29 SDI fields.

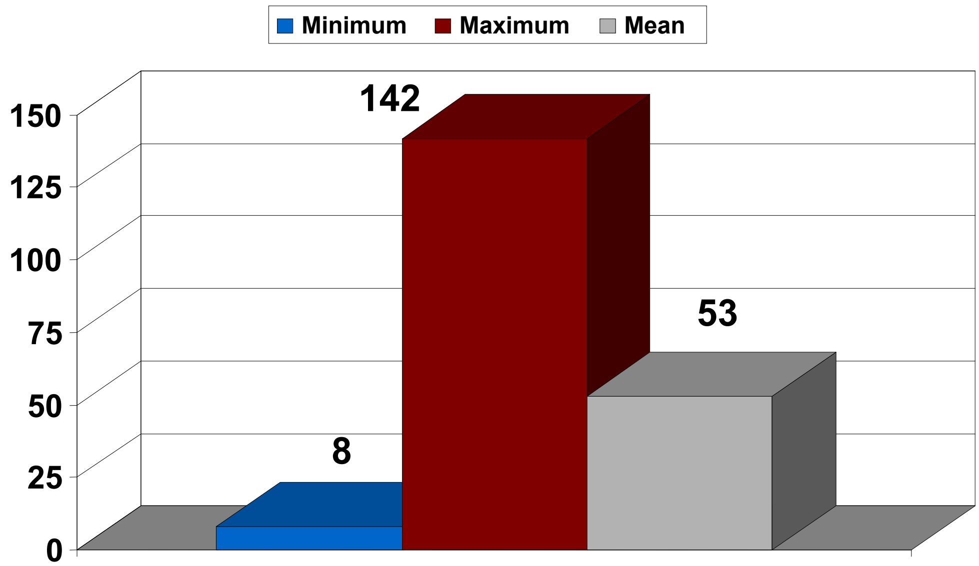

Figure 5. 0 to 24-inch NO_3-N (lbs/acre) found 36 LEPA irrigated fields.

Summary and Conclusions

Results indicate that of the fields sampled, irrigation system type generally did not affect residual N amount. The average lbs/acre residual N in the 0 to 24-inch depth by irrigation system type was: furrow 47, LESA 53, SDI 52, and LEPA 53. This information was relayed to cotton producer-cooperators by Extension agents in the 13 counties. With the total of 7,000 acres and an average of 50 lbs residual N/acre, the total amount of N saved by producers could approach 350,000 lbs. If an average price of $0.40/lb N is assumed, this results in about $140,000 potential fertilizer cost savings in the sampled fields. Implementation of deep sampling for N and adjusting on-farm fertilization should likely result in improved crop management. This could include less plant growth regulator usage, better harvest aid performance, possibly reduced *Verticillium* wilt incidence and potentially an improvement in cotton maturity.

References

Ashbrook, C. R. Boman, M. Kelley, and B. Holladay. 2010. A receiver hitch mounted device for deep soil sampling. pp. 1464-1466. Proc. Beltwide Cotton Conf., New Orleans, LA. 4-7 January. Natl. Cotton Council, Memphis, TN (CD-ROM).

Lemon, R., R. Boman, M. McFarland, B. Bean, T. Provin, and F. Hons. 2009. Nitrogen management in cotton. SCS-2009-1. Departmental publication.