

A RECEIVER HITCH MOUNTED DEVICE FOR DEEP SOIL SAMPLING**Chris Ashbrook****Randy Boman****Mark Kelley****Brian Holladay****Texas AgriLife Extension Service****Lubbock, TX****Abstract**

Because of higher fertilizer prices, need for deep soil sampling has increased. Earlier sampling conducted in 11 High Plains producer fields found 73, 64, and 52 lb N/acre in center pivot, furrow, and subsurface drip (SDI) fields, respectively, in the 0-24" depth. Previously, soil samples taken at the 0 to 6" depths could generally be easily acquired with a shovel or hand probe. However, soil sampling to depths up to 24" most often requires a hydraulic sampler. 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. A metal frame was designed and fabricated that can be easily inserted into a pickup receiver hitch. Some bracing was required to provide horizontal and vertical stability. Once inserted and secured into the receiver hitch, tighten the bolts on the balancing arms, and connect hoses to a hydraulic pump source. Attach the "quick attach" probe with the correct tip for soil conditions. Lower the probe into the until fully depressed into the soil then extract it. Separate the 0-6" increment from the 6-24" core sample and place in respective containers. The process should be repeated 15-20 times per 60-acre sampling zone, or more depending upon field conditions. Mix the soil in the individual 0-6" and 6-24" soil containers thoroughly to homogenize each sampling depth. The 0-6" sample can be used to determine the amount of residual NO₃-N in that depth, and the 6-24" sampling depth can be used to determine residual NO₃-N only.

Introduction

Because of higher fertilizer prices, need for deep soil sampling has increased. Based on previous deep soil sampling projects in Texas, it is important to determine residual NO₃ nitrogen (NO₃-N) available for cotton production (Lemon et al., 2009). Earlier sampling conducted in 11 High Plains producer fields found 73, 64, and 52 lb N/acre in center pivot, furrow, and subsurface drip (SDI) fields, respectively, in the 0-24" depth (Bronson, unpublished data, 2008). Two graphs representing varying urea-ammonium nitrate (UAN) prices per lb of N are presented. Figure 1 with \$0.45/lb N cost and Figure 2 with \$0.75/lb N cost (as was encountered in 2008) are provided to indicate the value of residual NO₃-N in 4 High Plains SDI fields sampled in 2009.

Previously, soil samples taken at the 0 to 6" depths could generally be easily acquired with a shovel or hand probe. However, soil sampling to depths up to 24" most often requires a hydraulic sampler. 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. The device consists of a hydraulic cylinder with a quick attach soil probe with several probe tips for varying soil conditions. These were purchased from AGVISE Laboratories, Northwood, ND, phone (701) 587-6010, www.agvise.com. A metal frame was designed and fabricated that can be easily inserted into a pickup receiver hitch. Some bracing was required to provide horizontal and vertical stability. The entire device weighs less than 100 lbs and with an estimated total cost of \$2,100 (includes 12-volt hydraulic pump).

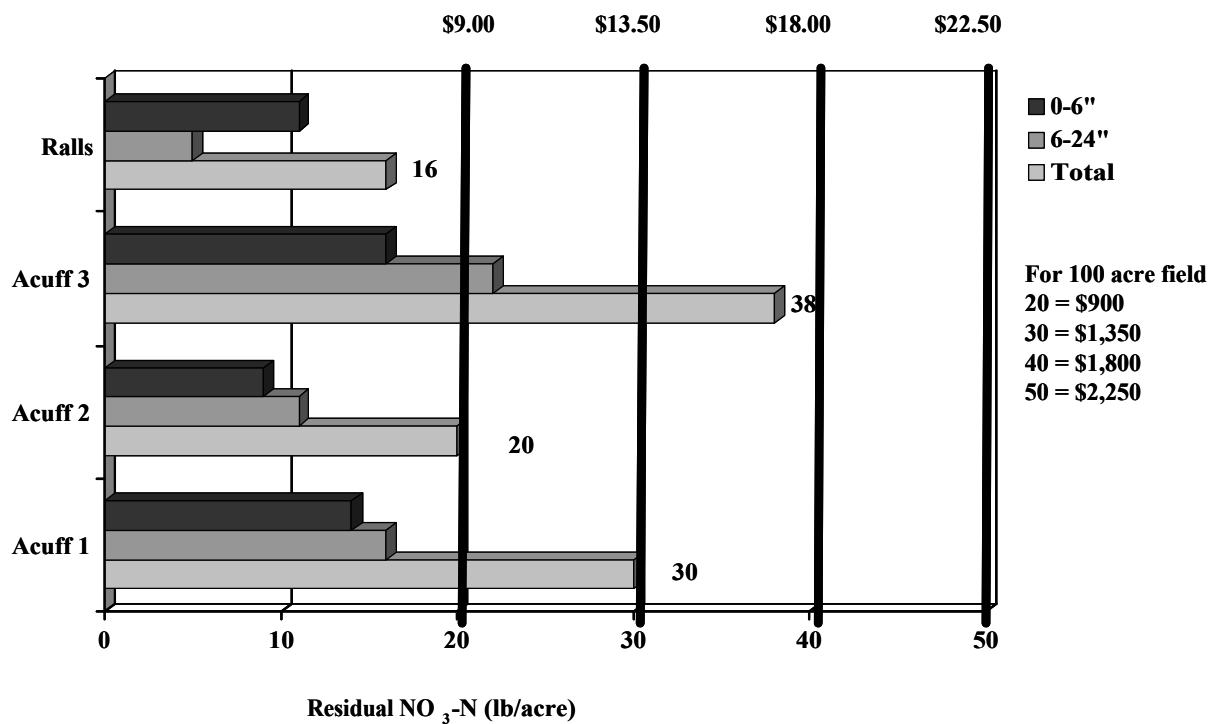


Figure 1. Value of Soil Residual N Replacement Value Based on \$0.45/lb N using UAN)

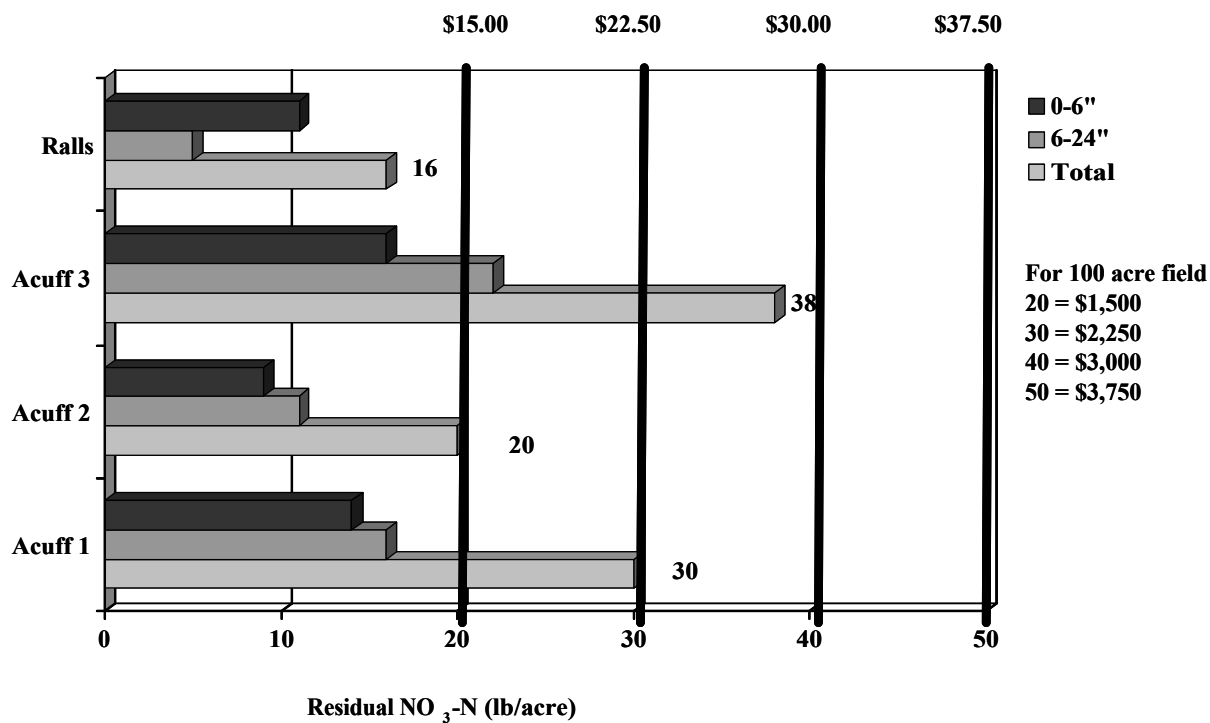


Figure 2. Value of Soil Residual N Replacement Value Based on \$0.75/lb N using UAN)

Procedure

Once inserted and secured into the receiver hitch, tighten the bolts on the balancing arms, and connect hoses to a hydraulic pump source. Once in the field attach the "quick attach" probe with the correct tip for soil conditions. Engage the control valve to lower the probe into the soil while ensuring that the probe is vertical. After the probe gets fully depressed into the soil, reverse the control valve to extract it. After removal of the probe from the hydraulic piston, separate the 0-6" increment from the 6-24" core sample and place each in its respective container. The process should be repeated 15-20 times per 60-acre sampling zone, or more depending upon field conditions. Mix the soil in the individual 0-6" and 6-24" soil containers thoroughly to homogenize each sampling depth. The 0-6" sample can be used to determine the amount of residual NO₃-N in that depth, and to provide a fertilizer recommendation for other plant nutrients. The 6-24" sampling depth can be used to determine residual NO₃-N only. For more information refer to Lemon et al., 2009.

References

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