INTRODUCTION

Dynamic soil properties (DSPs) are indicators of soil health and function that change over short time scales due to changes in environmental conditions or management practices. Conservation tillage is a management practice that reduces soil disturbance and has been shown to improve soil health, as measured by DSPs. This study, part of a national NRCS project on DSPs and soil health, investigates the impact of tillage practices in Hidalgo sandy clay loam, a soil series that spans more than 250,000 acres in south Texas. We measure DSPs including organic carbon and nitrogen, aggregation, infiltration, bulk density, respiration, biological community structure and enzymes in unirrigated agricultural fields in Hidalgo and Willacy counties with a history of strip tillage, intermittent strip tillage, and conventional tillage. A minimally disturbed natural site is also included as a reference point. Local lab results will be compared to results from the NRCS Kellogg Soil Survey Laboratory to help standardize laboratory procedures and increase accuracy for future soil tests in our region. Improved local DSP testing capacity and better data on conservation tillage’s impacts on soil health will support efforts to expand conservation agriculture practices in the Lower Rio Grande Valley.

STUDY AREA & SITE SELECTION

- 10 sites selected using soil classifications from USDA Web Soil Survey
- 3 conventional tilled fields
- 3 strip tilled fields
- 3 intermittent tilled fields
- 1 ecological reference

- For each site, three sampling locations were chosen
- 2 one-meter-deep cores with Edelman probe
- 5 additional surface cores (first 10 cm)
- Cores combined for a composite sample separated by horizon
- Field assessment includes:
  - NRCS field metrics
  - Infiltration using single ring, SaturO, and Cornell infiltrometers
- 11 fields x 3 sampling locations x 6 horizons = 198 total soil samples
- Each sample tested by UTRGV and the NRCS Kellogg Soil Survey Laboratory (KSSL) for lab testing listed at right

PRIOR RESEARCH AND EXPECTED RESULTS

We expect fields with reduced soil disturbance (strip tillage and intermittent tillage) to compare favorably to those with higher soil disturbance (conventional tillage) for all measured DSPs. Prior research shows higher soil organic matter and water retention for fields under conservation tillage, especially for the top 30 cm of soil [2]. Soil biological activity such as microbial biomass also improves under no till conditions [1]. Over time, improved dynamic soil properties as a result of conservation practices like strip tillage ideally can help reduce costs and improve returns for farmers [3].

SAMPLE COLLECTION & LAB TESTING

Soil Processing:
- All samples will be processed prior to laboratory procedures
- 150g (wet) of each layer per site location to U of Missouri for PLFA analysis
- 60g (wet) from top 10 cm per site location to USDA ARS-Temple for Haney test
- 1 pint (air dry) of each layer per site location to KSSL for laboratory testing
- 300g (air dry and grounded) of each layer per site to KSSL for laboratory testing
- Remaining sample will be air dried in labeled paper bags for a total of 2 weeks, ground, and stored cold and dry until further testing at UTRGV (Labs 1-7).

LAB 1 - Soil Organic Carbon by Dry Combustion

LABS 2 & 3 – Aggregation (multiple methods)

LAB 4 – Soil Respiration (4-day Incubation)

LAB 5 – Soil Enzymes

LAB 6 – Permanganate Oxidizable Carbon

LAB 7 – Available Organic Nitrogen

LAB 8 – Community Structure (Phospholipid Fatty Acid)

CURRENT PROJECTS & COLLABORATIONS

- Luz Ballesteros
  - Understanding soil chemical changes in a lower Rio Grande Valley conservation tillage chronosequence

- Temiloluwa Awoteye
  - Comparing aggregation and infiltration methods among tillage regimes in Hidalgo sandy clay loam

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REFERENCES


FILE://C:/Users/luzb1/Downloads/HealthySoil_FS.pdf