EVALUATION AND QUANTIFICATION OF ENVIRONMENTAL SUSTAINABILITY OF TILLAGE TREATMENTS IN THE COASTAL BEND REGION OF TEXAS

Andrea Maeda
Texas A&M Agrilife Research
Corpus Christi, TX
Guadalupe Rodriguez
Texas A&M University-Kingsville
Kingsville, TX
Juan Landivar
Kenneth Schaeffer
Texas A&M Agrilife Research
Corpus Christi, TX

Abstract

Food, fiber, and biofuel production are currently limited by factors including climate change and depletion of natural resources. With the world population expected to reach 9 billion over the next 30 years, it is crucial to address these challenges through alternative and efficient production systems that support high productivity while curtailing ecological imbalance. Current management practices in south Texas include winter fallow and repeated tillage, which leaves the soil prone to erosion, reduces water infiltration, and increases runoff. The adoption of more sustainable management practices like conservation tillage could be helpful to increase water infiltration, decrease greenhouse gas emissions, buffer soil temperature, decrease soil erosion and support microbiome development. The main goal of this project is to evaluate the agricultural performance and sustainability of cotton production under different tillage practices in the Coastal Bend region of Texas. This study has been conducted at Texas A&M Agrilife Research and Extension Center in Corpus Christi, TX since 2011. Cotton/sorghum rotation plots were established in a split plot design with no-tillage and conventional tillage practices as sub-plots in a rain-fed field. Yield was measured at the end of the season upon harvest. Soil analysis was performed in the fall. The Fieldprint® calculator was used as an auxiliary tool to quantify sustainability parameters such as greenhouse gas emissions, energy use, land use, water quality, soil erosion, and soil carbon. Cotton lint yield was significantly higher ($p<0.05$) when no-tillage practices were adopted. Although numerically higher, soil organic matter was not significantly different across treatments. Lastly, no-tillage plots had lower environmental impact according to the Fieldprint® calculator. Due to the ability of no-tillage systems to increase water infiltration and to store water in the soil more efficiently, this practice could be advantageous on dry years and/or in places where rainfall is not evenly distributed within the season.