# MULTIPLE CONSERVATION PRACTICES FOR REDUCING GREENHOUSE GAS EMISSIONS IN IRRIGATED COTTON

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## Abstract

Agricultural soils are the dominant source of greenhouse gas (GHG) emissions accounting for about 11% of global emissions. Mitigation practices have been developed for crop cultivation, but their efficacies vary by crop and environment, hence, integrated management practices are realized. Multiple conservation practices can be more effective strategy to reduce GHG emissions. This study investigated the many conservation practices that aim to reduce GHG emission footprint in cotton. The experiment was designed as a randomized complete block design with Irrigated, IR vs Rainfed, RA and 2 cropping systems (Conventional, CT:[cereal rye winter cover crop/no-till/ mowed turn-row and with vegetated field buffer strip] vs Conservation, FT: [re-bedding in spring, furrow tillage prior to first irrigation, non-vegetated turn-row & field border]) replicated three times. Methane, $N_2O$, and $CO_2$ fluxes were measured using a static flux chamber technique from two locations (within and between rows) within each treatment replicate. In all cropping management systems, $CH_4$ fluxes were low and below the detection limit of measurements. Annual $N_2O$ emissions ranged from 0.8 to 1.5 mg $N_2O$-N $ha^{-1}$ $yr^{-1}$ with emissions not affected by tillage and cropping practices. Large $N_2O$ emissions were associated with N fertilizer application and heavy rainfall in early summer and fall seasons. In contrast, annual $CO_2$ emissions (3.8-6.3 Mg $CO_2$-C $ha^{-1}$ $yr^{-1}$) were significantly different between tillage and irrigation systems ($P$ = 0.02-0.001) with 35% larger emissions measured in the conservation irrigated systems relative to conventional irrigated systems. Emission of $CO_2$ mainly constituted (97%) global warming potential (GWP) in all treatments. The GWP values of $CO_2$ emissions were related to conservation practices that increased the vegetative cover and/or amount of crop residues in the field. This study highlights the direct influence of some conservation practices on GHG emissions and the tradeoffs between preserving water and soil qualities and greenhouse gas emissions in cotton production.