

Abstract

Objective: To evaluate the influence of soil profile based tillage practices on soil properties and wheat production within the Central Rift Valley Province of Kenya Methodology and results: The tillage systems studied were (1) Continuous No-till –NT (mulch and herbicide); (2) Continuous minimum -MT1 (1 disc harrow + chisel plow with sweeps); (3) Continuous minimum -MT2 (herbicide + chisel plow with crumblier roller); (4) Continuous conventional -CT (1 disc plow + 2 disc harrows + 1 light tine harrow); and (5) Alternating the systems above i.e. CT in 2003, NT in 2004 and MT2 in 2005. The three tillage practices compared were conventional, conservation and alternating (conventional and conservation) tillage. Treatments were laid out in a Randomized Complete Block Design (RCBD) with three replicates. In each case, soil was left undisturbed from harvesting until planting of the subsequent season. Soil physical and chemical properties were assessed for each system before the start of the experiment in 2003 and after harvest in 2005. Yield and yield components were also determined. Soil profile analyses showed that the topsoil was shallow, being immediately underlain by pumice. The subsoil had more available P, Cu and organic C than the topsoil. The subsoil had better Ca: Mg nutrient supply ratio of 2:1 and Ca: K ratio of 9.7 compared to that of topsoil of 2:7 and 7:8, respectively. Reduced tillage systems MT2 produced significantly higher grain than conventional tillage CT. Conservation tillage systems resulted in higher percentage soil organic matter (SOM) than CT and higher water stable aggregates (WSA) than conventional tillage. It took less time to prepare a seedbed in conservation tillage than conventional tillage. The order of infiltration rates was CT (12 cm/hr) > MT1 (8.6 cm/hr) > MT2 (5.2 cm/hr) > NT (3.7 cm/hr). However, the soil water infiltrating into the subsoil would be considered lost owing to the pumice layer underlying the topsoil that blocked water from rising by capillarity from subsoil. Conventional tillage also resulted in more compaction than conservation tillage. Conclusion: To facilitate sustainable wheat production in the Central Rift region of Kenya, conservation tillage is a better option than other tillage practices.