Soil compaction is a common problem of mineral soils under conventional tillage practices. Organic matter addition is an efficient way of reducing the effects of field traffic in soil compaction. The aim of this study was to investigate the effects of number of tractor passes (one, three, and five) on depth-dependent (0–10 and 10–20 cm) penetration resistance, bulk density, and porosity of clay-textured soil (Typic Xerofluvent) under organic vegetable cultivation practices in the 2010–2013 growing seasons. Fields were treated with farmyard manure (FYM, 35 t ha⁻¹), green manure (GM; common vetch, Vicia sativa L.), and conventional tillage (CT). The number of tractor passes resulted in increases in bulk density and penetration resistance (CT > GM > FYM), whereas the volume of total and macropores decreased. The maximum penetration resistance (3.60 MPa) was recorded in the CT treatment with five passes at 0–10 cm depth, whereas the minimum (1.64 MPa) was observed for the FYM treatment with one pass at 10–20 cm depth. The highest bulk density was determined as 1.61 g cm⁻³ for the CT treatment with five passes at 10–20 cm depth; the smallest value was 1.25 g cm⁻³ in the FYM treatment with only one pass at 0–10 cm depth. The highest total and macropore volumes were determined as 0.53 and 0.16 cm⁻³ respectively at 0–10 cm depth for the FYM treatment with one pass. The volume of micropores (0.38 cm⁻³) was higher at 0–10 cm depth for the FYM treatment with three passes. It can be concluded that organic pre-composted organic amendment rather than green manure is likely to be more efficient in mitigating compaction problems in soil.