A study of environmental chloride, deuterium, oxygen-18, and tritium in deep sand profiles (35 m) has been carried out in order to estimate their relative value for measuring average groundwater recharge. The investigation was located at a 0.1-km^2 site in Quaternary sands near the northwestern coast of Senegal in a zone of rainfed agriculture. By using a steady-state model for duplicate unsaturated zone chloride profiles, the long-term average recharge at the site was estimated to be 30 mm yr^{-1} or around 10% of the average precipitation (290 mm). The chloride concentration of adjacent shallow groundwater was relatively uniform and comparable to the unsaturated zone average, while the spatial variability in the depth distribution of Cl^- in the unsaturated zone was considerable. Stable isotope (deuterium and oxygen-18) data show that there is some isotopic enrichment due to direct evaporation through the soil surface. The degree of heavy isotope enrichment is proportional to the extent of evaporative loss and there is good correspondance with the chloride enrichment. Nevertheless, stable isotopes cannot be used quantitatively to estimate the recharge. The excellent preservation of the peak in thermonuclear tritium in precipitation in the unsaturated zone at depths between 12 and 20 m enables an estimated annual recharge of 24 mm yr^{-1} in this area to be calculated, using the piston flow model. Agreement therefore between Cl and ^3H as tools for recharge measurement is reasonable over the site.