A significant new technique for studying the dynamics of crop and soil interactions is the video tape recording of roots intersecting the surfaces of minirhizotrons. These video tape recordings may be manually observed and archived for future analyses by computer-aided image processing. Previous use of minirhizotrons has been intermittent largely because of difficulties with field collection, storage, and analysis of large data sets. Nonetheless, the ease with which data can now be collected electronically should not over-ride the continuing problems of analyzing and interpreting these data. Users of minirhizotrons record complex images containing randomly branched root systems; soil particles; and voids associated with the displacement of stones, soil cracks, soil organic matter, and insects. Additionally, there are natural and intentional scorings on the walls of the minirhizotron tubes. The discrimination of viable roots against this highly variable background is particularly difficult, especially when roots have small diameters; when there is little contrast between the roots and soil; or when visibility through the wall of the tube is obscured by the smearing of soil, growth of fungal hyphae, or bacteria.

Quantification of roots from images that have been properly segmented may contain more than 35 categories of information regarding root and soil systems. For example, the analysis of video root images may provide the total length of a root system, maximum root depth, root system modification in each soil horizon, the total length of each level of branching, diameters, volumes and surface areas of each level of branching, total volume and surface area for the entire root system observed, frequency of branching for...