OBJECTIVES

1. To collect samples of important prune and walnut orchard soils, with and without water infiltration problems, and determine for these the physical and chemical characteristics that contribute most to surface sealing, soil compaction, and slow water infiltration, taking into consideration the interaction of these characteristics with various irrigation water qualities.

2. To develop criteria for predicting the likelihood of improving water infiltration in these orchard soils by use of the following practices: (a) a change in irrigation management or method; (b) clean cultivation vs. annual cover crop vs. permanent sod; (c) ripping or slip plowing between trees; (d) applying amendments to the soil or mixing with irrigation water.

PROCEDURE

Funds for this project were finally assured in October 1981 and a graduate student was hired to begin November 1. Soil samples have been collected from four prune or walnut orchards with water infiltration problems (Yuba, Butte, Glenn, and Yolo Counties) and two without apparent problems (Yuba and Butte Counties). Irrigation water samples were also collected. Characterization of these soils has begun, with particle size analyses being nearly completed. Other analyses will include pH, EC, CEC, exchangeable Ca, Mg, Na, K, clay mineral identification, aggregate stability, organic matter, thin section study, hydraulic conductivity with waters of different qualities, and field infiltration and density measurements.

Additional soil samples will be collected during 1982 from prune and walnut orchards. Where possible, paired samples, one giving infiltration problems and the other not, will be collected from the same grower using the same irrigation water and management practices on each. Some samples will be collected twice, once in the spring and once in midsummer. Differences in soil properties due to increasing soil temperature and dehydration as summer progresses may explain the often observed reduction in infiltration rate in midsummer.

This project will benefit from the increasing interest in soil crusting and sealing by cooperating scientists at U.C.-Davis, U.C.-Riverside, and the USDA Salinity Laboratory at Riverside. In addition to analyses by the half time research assistant hired directly from project funds, the same prune and walnut soil samples will be analyzed for their crusting tendencies by a graduate student under the direction of Dr. Michael J. Singer of U.C.-Davis, and will be analyzed for aggregate dispersion by Dr. James Rhoades of the U.S. Salinity Laboratory.
RESULTS AND CONCLUSIONS

No results are yet available since laboratory work only recently began. The first results will be particle size analyses, with particular attention given to differences in the subfractions of the sand, silt and clay fractions. Certain combinations of subfractions of sand and silt may be more conducive to aggregate instability and particle interlocking than others. Clay distribution between coarse and fine fractions relates to clay mineral type, which in turn affects aggregate stability. For example, montmorillonite resists dispersing in much more dilute electrolyte solutions than illite does. When differences in texture and clay mineralogy between two soils are compounded with differences in organic matter, exchangeable cations, and irrigation water quality, the possibilities for differences in aggregate stability multiply rapidly.