

# Management of water resources in rainfed agriculture

Glen H. Cannell

Throughout the agricultural world, the mention of California brings to mind the image of a very rich irrigated agricultural production region. The state's rainfed agriculture is often overlooked—probably because the mainstream of travel cuts across the irrigated valleys.

Comparing irrigated and nonirrigated cropland acreage reveals the importance of nonirrigated agriculture in California (see table). About 33 percent of California's cropland was rainfed in 1960; 20 percent rainfed cropland is estimated for 1980. The decrease in percentage of nonirrigated cropland is largely because of an increase in irrigated cropland.

Of the total acreage used for cropland and animal production, about 75 percent is rainfed. The effective use of this large natural resource becomes more important as the state's population increases and further pressures are exerted on water resources.

California's climate generally provides warm, dry growing weather with precipitation occurring during the winter—as snow at higher elevations, and as rain in the lower areas. Winter precipitation is advantageous for dryland farming because it comes when evaporative rate and plant growth are at a minimum, allowing maximum storage of rainfall in the soil.

Effective dryland crop production methods have been developed by the United States Department of Agriculture (USDA), which began field studies on dryland grain production in the early 1940s in southern California, and by University of California researchers. These methods are being used by farmers throughout the state.

## Conservation

Dryland farming requires conservation of soil and water. If crop residues are left on the soil surface or mulched into the soil, runoff is controlled and water erosion is decreased. The resulting improvement in water penetration may equal several inches of rainfall annually. Other soil and water conservation methods practiced in California include terracing, contour farming, windbreaks to control wind erosion, and tillage in which the soil is left in a rough or cloddy condition to trap soil moved by wind.

Even the best conservation practices do not prevent erosion during heavy or prolonged rainstorms. Even under these conditions, however, erosion is considerably reduced by terraces, check dams, lined waterways, brush mats, open ditches, and tile drains. Excess water is often collected in ponds or "tanks" and used for stock and for supplemental irrigation, thus further conserving water.

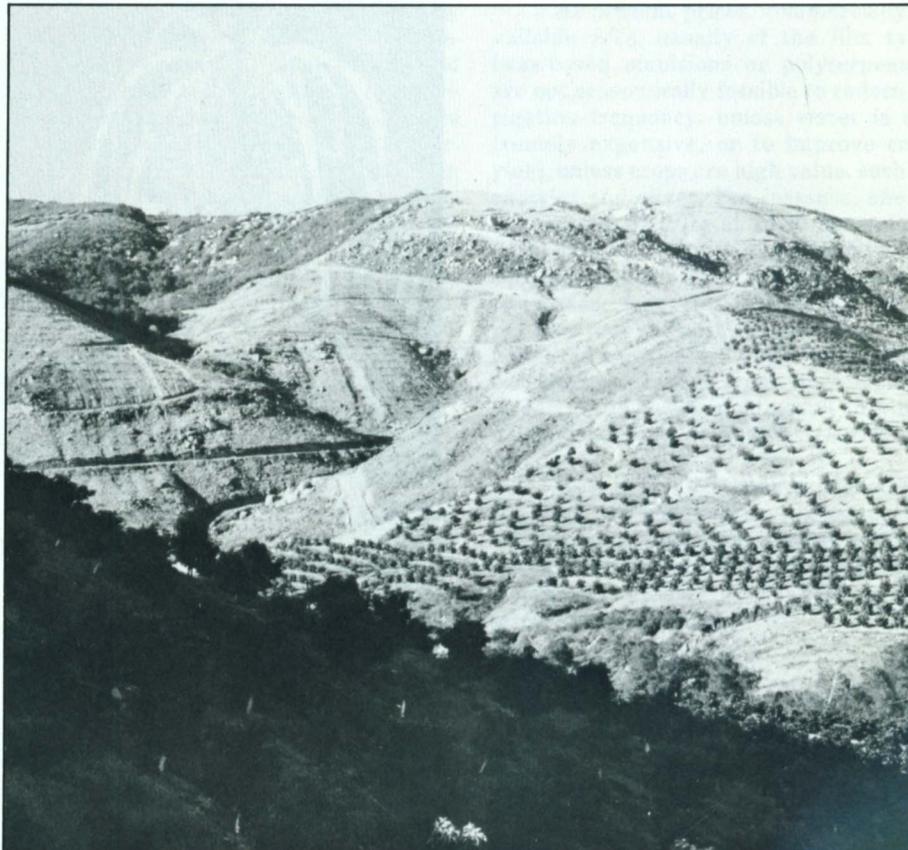
With the exception of some studies on plant breeding of grain crops by specialists in Cooperative Extension, research on dryland crop production in California is very limited at present. The USDA discontinued its southern California studies on dryland agriculture in 1970, and is now conducting no soil water and fertility research in California.

## Research programs

There are research programs, however, that have a bearing on dryland farming. The Agency for International Development has awarded the University of California, Riverside, a five-year grant to study moisture utilization in the semi-arid tropics. This project, now in its third year, has computerized its information, including information from research in dryland agriculture. It also supports basic research by graduate students in dryland agriculture, as well as applied research on crops grown in California and the semi-arid tropics. Some results on yields of cowpeas and factors affecting their production have been obtained.

For the past several years, researchers at the University of California, Davis, have been studying water requirements of crops, water regime relative to planting date, and level of water stress at which crops suffer and crop yields are reduced. They have considered such factors as climate and soil, and crop growth stages; and such plant characteristics as root systems and canopy development.

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Conversion of dryland agriculture to irrigation of avocados in Fallbrook, California.

Estimated Use of California Land by Hydrologic Area-1960 and Projected 1980 and 2000				
Year	Irrigated cropland	Nonirrigated cropland	Pasture and range	Forest and woodland with grazing
acres × 1,000				
1960	8,085	4,069	13,494	8,959
1980	9,060	2,988	12,806	8,605
2000	9,970	2,387	12,442	8,445

Source: Gerald W. Dean and Gordon A. King. Projection of California Agriculture to 1980 and 2000: Potential Impact of San Joaquin Valley West Side Development. California Agricultural Experiment Station, Giannini Foundation Research Report No. 312, Part I, September 1970. Excerpt from table 16, page 54.