Water use of dry-farmed almonds under clean and noncultivation conditions

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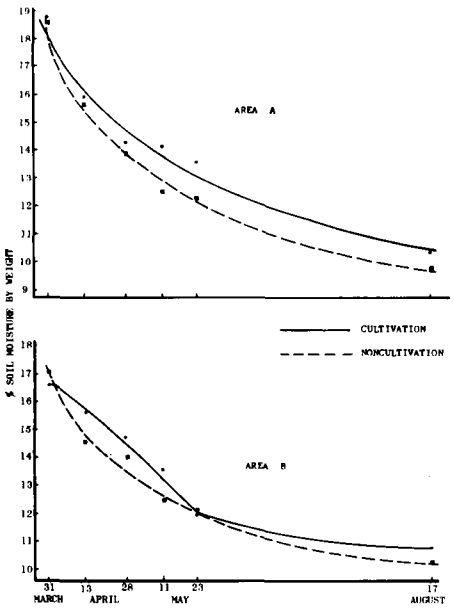
Test plots for this water-use study were in a dry-farmed almond orchard, part of which was under non-tillage and part under clean cultivation. Soil moisture sampling showed that in years of heavy winter cover crop growth, more moisture was used out of the chopped than out of the cultivated plots. But the almond trees were remarkably able to stretch the available soil moisture supply almost to the end of the growing season.

THE PRACTICE OF noncultivation has become established in many irrigated orchards of California. In dry-farmed almond orchards, noncultivation would be desirable in the preparation of a smooth ground surface for mechanical harvesting. This would eliminate costly cultural operations and land preparation, as practiced under clean cultivation, and would reduce clods and dirt during harvest. In addition, soil erosion is decreased on the steeper slopes when a ground cover is maintained—leaving the soil undisturbed. The winter cover crop is simply chopped two to three times (depending on spring rains) and then decays during spring and summer, leaving a clean, smooth soil surface for harvest. This practice raises the question as to whether there is an additional water use by the cover crop under noncultivation.



Graph 1. Moisture content of soil in cultivoted and non-cultivated dry land almond orchard—Capay Valley, Yolo County, 1964.

Soil sampling

A dry-farmed almond orchard, part chopped and part cultivated, was the site of this three-year study in the Capay Valley of Yolo County. Samples for soil-moisture determination were taken at regular intervals from both noncultivated and cultivated trees located in each of two areas (A and B on graphs) in the orchard. The sample trees were of the same variety and comparable in size. The soil was a Yolo loam. Samples were taken to a depth of 3 ft, which was the extent of rooting of the natural cover crop growth of filaree, burr clover, fox-tail and wild oats. The almond tree is known to extract about 50% of its moisture needs from the top 3 ft of soil. Annual average rainfall in the area is about 20 inches, but in the two experimental years (1964 and 1966) the rainfall was about 20% below normal. Winter rains during these two years had wet the soil to only 4½ ft and about 80% of the absorbed moisture was extracted out of the first 3 ft (as shown by sampling to a depth of 6 ft).

Results

Graphs 1 to 3 show soil-moisture depletion for the three test years. In 1964 there was slightly greater total water extraction from the noncultivated than from the cultivated plots. The rate of extraction in the noncultivated plots early in the season, with the natural cover growing was greater in both 1964 and 1965. This more rapid extraction occurred in the first foot only. In 1966 there was very little cover crop growth, and the more rapid depletion out of the first foot did not occur. On the whole, it appears that there is a slightly greater water extraction from the noncultivated plots in years of lush cover crop growth. This occurs primarily during the spring growing season.

An interesting feature of physiological significance is that the rate of water removal lessens as the soil moisture supply is reduced. Most deciduous fruit trees withdraw water from field capacity to the wilting point at the same rates which, when plotted, result in a straight line. This means that most trees have little control over moisture removal. Almonds, however, apparently respond to increasing soil-moisture stress by reducing the rate of extraction. Thus they are able to extend the period of the available water supply. The table shows actual water removal from the dryland almond orchard in Capay Valley, compared with the potential (average at Davis). The potential water use is the maximum water transpired by a grass cover that is never short of water. If the almond were not able to exert control ever transpiration, it should use more water in June than in May. In reality the dry land almond orchard used less water in June than in May—which indicates some control of soil water extraction by almonds under moisture stress.

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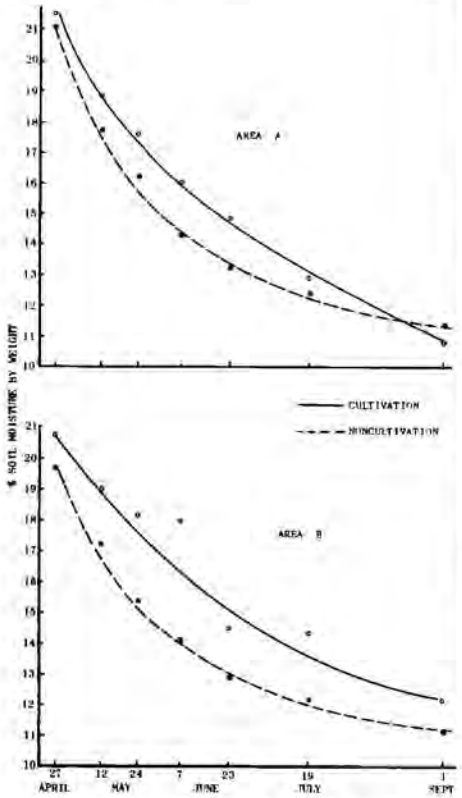
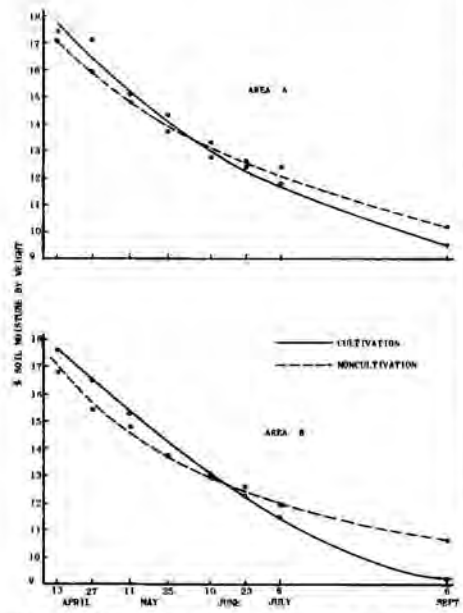
ACTUAL AND POTENTIAL WATER USE
IN A YOLO COUNTY ALMOND ORCHARD
(Data from 0 to 3 ft level)

Month	Actual water use acre/ft			Potential water use acre/ft		
	Year			Year		
	1964	1965	1966	1964	1965	1966
May	0.9	2.3	1.1	6.4	7.4	6.8
June	0.5	1.1	0.7	6.7	7.3	7.9



Graph 2. Moisture content of soil in cultivated and non-cultivated dry land almond orchard—Capay Valley, Yolo County, 1965.



Graph 3. Moisture content of soil in cultivated and non-cultivated dry land almond orchard—Capay Valley, Yolo County, 1966.

RESEARCH PREVIEWS

A continuing program of research in many aspects of agriculture is carried on at University campuses, field stations, leased areas, and many temporary plots loaned by cooperating landowners throughout the state. Listed below are some of the projects currently under way, but on which no formal progress reports can yet be made.

CITRUS THRIPS CONTROL

Entomologists at Riverside are experimenting with a plot in which the native California sumac has been interplanted between the rows of citrus trees. Since the sumac is preferentially attractive to citrus thrips it is thought that all or most of the thrips will be drawn away from the citrus to the sumac. The sumac bushes are not yet large enough for conclusive evaluation of the project.

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INCOMPLETE CHICKENS

Poultry husbandmen at Berkeley are trying to determine why the removal of a chicken's pancreas, which supplies glucagon and insulin, does not lead to diabetes as it does in the mammal. The chickens survive but do not increase body weight normally, nor do they accumulate body fat as do normal chickens.

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POLLENIZING DATES

With the adoption of mechanical date harvesting an accomplished fact, agricultural engineers at Riverside are turning their attention to developing mechanical means of pollenizing the fruit. The most promising method tried so far involves the use of helicopters. Further studies are aimed at refining the techniques.

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SIDE CRACKING OF PRUNES

Pomologists at Davis have found that side cracks appear most commonly on prunes growing on the south or southwest sides of trees, and on the outer (exposed) side of the fruit. This may be related to differences in temperature and moisture content found between the outer and inner sides of the fruit. Additional experiments planned include tests with spray applications that might reduce the susceptibility of prunes to cracking.

ROOTING OF PLANTS

Controlled environment experiments by floriculturists at Los Angeles have shown that the rooting of ivy stem cuttings may be affected by the color of the light to which they are exposed during growth of the stock plant. Those exposed to red light formed more roots than those under blue or low-intensity white light. It is planned to continue these experiments using other plants and other light colors.

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POTATO TUBERMOTH RESEARCH

Entomologists at Davis are trying to isolate the sex attractant produced by the female potato tubermoth. Extremely small amounts of the material will attract males in the laboratory. Field application is being tested for possible use as an attractant in traps.

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RUSSIAN THISTLE CONTROL

Riverside and cooperating federal entomologists are seeking (overseas) one or more host-specific insects that will attack and destroy Russian thistle. The insects that now prey on the thistle in California cause little injury to this introduced weed and attack many other plants as well.

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SOLAR RADIATION STUDIES

Agricultural meteorologists are developing techniques and instruments to increase knowledge of two aspects of solar radiation—that which comes through to the earth's surface, and that which reflects outward to space from the earth and atmosphere. That which reaches the earth's surface has an important effect on plant growth, animal responses, and even the design of buildings. That which is directed to space is sensed by meteorological satellites and is important in determining the energy budget of the entire earth-atmosphere system.