

Water, Water, Every...Where?

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California's irrigation water availability is increasingly precarious as the state's population grows and urban demands for water become greater. The problem is exacerbated in cycles of low rainfall. As this is written, California is in the grip of a drought in the fourth year of subnormal rainfall—and may be facing a fifth subnormal rainfall year.

A difficult question of tremendous importance is, who is to have water when there is not enough to go around? If California is to remain a food producing place, and a major contributor to the state's economy, agriculture must have water. If there is not sufficient water to go around, the question may well be asked, who in agriculture is to have what there is?

An approach to that question could be that agricultural water should go to the producers of the crops that use water most efficiently in terms of usable food energy produced. Food energy "efficiency" is measurable. It is explored here for the calorie yields of various crops per acre foot of applied water, calories being the measure of food energy.

Twenty crops, arbitrarily selected, are measured against that criterion in the accompanying table. Because the specific purpose of this study was to determine the relative "efficiency" of avocados, that commodity is included at three different levels of total yield per acre:

Actual average statewide production in 1989 was used for avocados (4,388 pounds per acre), as it was for all the other crops in the study.

Also measured was avocado production at 10,000 pounds per acre, a yield commonly achieved by commercial avocado growers.

In addition, production at 20,000 pounds per acre was measured as probably achievable from new varieties becoming available to growers.

Avocados rank high at each of the measured levels of production, in terms of edible food calories produced per acre foot of applied water: seventh highest among the twenty crops at the statewide average yield, third highest at the "commonly-achieved commercial" yield, and first by a substantial margin at the "new varieties" potential yield.

These findings signal a level of importance for avocados as a food energy resource that may not have been fully appreciated. When the "nutrient density" attributes of this crop are also considered, avocado appears to be a worthy candidate for high priority consideration in any allocation of rationed irrigation water.

COMPARATIVE PRODUCTION OF CALORIES PER ACRE
AND PER ACRE FOOT OF APPLIED WATER

CROP	1989 Acreage	1989 Production	Lbs./Acre	% Edible	Edible Lbs. per Acre	Calories per Pound	Calories per Acre	Applied Water Acre Ft./Acre	Calories per Acre Ft. Water
AVOCADOS	75,200	1,504,000,000	20,000	75%	15,000	568	8,520,000	1.18	7,220,339
Potatoes	49,100	1,799,200,000	36,644	81%	29,681	279	8,281,084	2.13	3,887,833
Strawberries	19,900	835,800,000	42,000	96%	40,320	161	6,491,520	1.69	3,841,136
AVOCADOS	75,200	752,000,000	10,000	75%	7,500	568	4,260,000	1.18	3,610,169
Apples	29,100	675,000,000	23,196	92%	21,340	242	5,164,330	1.60	3,227,706
Prunes (dried)	76,900	452,000,000	5,878	85%	4,996	983	4,911,165	1.55	3,168,494
Pears	23,000	630,000,000	27,391	91%	24,926	252	6,281,374	1.99	3,156,469
Tomatoes	314,900	18,169,000,000	57,698	100%	57,698	100	5,769,768	2.43	2,374,390
AVOCADOS	75,200	330,000,000	4,388	75%	3,291	568	1,869,415	1.18	1,584,250
Grapes	641,700	10,780,000,000	16,799	89%	14,951	270	4,036,830	2.77	1,457,339
Lemons	48,400	1,231,200,000	25,438	67%	17,043	82	1,397,565	0.98	1,426,086
Oranges	176,600	4,410,000,000	24,972	73%	18,229	162	2,953,152	2.36	1,251,335
Peaches	54,500	1,516,000,000	27,817	87%	24,200	150	3,630,055	2.97	1,222,241
Lettuce	168,400	5,725,600,000	34,000	95%	32,300	56	1,808,800	1.49	1,213,960
Plums	40,600	426,000,000	10,493	91%	9,548	272	2,597,131	2.83	917,714
Carrots	57,600	1,785,600,000	31,000	59%	18,290	112	2,048,480	2.36	868,000
Walnuts	177,000	458,000,000	2,588	45%	1,164	1,329	1,547,497	2.29	675,763
Broccoli	101,600	1,219,200,000	12,000	61%	7,320	89	651,480	2.25	289,547
Corn (sweet)	17,500	201,400,000	11,509	36%	4,143	157	650,464	2.76	235,676
Cantaloupes	82,200	1,315,200,000	16,000	50%	8,000	68	544,000	2.43	223,868
Cauliflower	52,500	603,800,000	11,501	49%	5,635	48	270,502	1.61	168,014
Asparagus	37,500	108,800,000	2,901	56%	1,625	66	107,233	6.03	17,783

Sources: California Agriculture Statistical Review 1989, California Department of Food and Agriculture
Composition of Foods, Agriculture Handbook No. 8, U.S. Department of Agriculture, December 1963
Crop Water Use in California, California Department of Water Resources, December 1986