Farm Labor Productivity Tradeoff with Water Use
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Farm Labor Productivity Tradeoff with Water Use

Mason Gaffney, Working Paper

INTRODUCTION

Data are presented here on the average product (AP) per worker in different farm crop types, contrasting field crops (extensive use), and horticulture (intensive use). There are also data on manufacturing. The data were found in a study by Foster Economics, San Francisco,[1] of how jobs are tied to water use, and reworked for the present purpose. They shed incidental light on yields per unit of water.

Field crops[2] employ only 5% as many workers/kaf[3] as vegetables, fruits, and nuts. Field crops consume over 67% of the farm water in California, but employ only 8% of the on-farm labor force.[4] Crop data are listed below, along with manufacturing data.

On-farm jobs[5] per kaf, by crop type: (from pp.1, 5)

Field crops, 1.5

Vegetables, 20

Fruits and nuts, 22

Manufacturing, ? 2,600 ?[6]

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[1]David L. Mitchell, 1993. "Water Marketing in California." Foster Economics, 120 Montgomery St. #1776, S.F. 94104. William Wade, principal. Sponsored and distributed free by Bay Area Economic Forum, and MWDSC. (It is part of a political campaign to rationalize moving water to cities. Its selection of data should be evaluated with awareness of that purpose.)

Mitchell's primary data are cited to DWR Bull 113-4, April 1986; and County Agricultural Commission Reports, 1990.

[2]"Field crops" = cotton, grains, hay, rice, etc.

[3]"kaf" = thousand acre-feet of water.

[4]Mitchell, p. 5.

[5]"FTE (full-time equivalent) jobs."

[6]Mitchell, p. 1. Mitchell gives no source for the data on manufacturing, nor any description of what they mean in detail. They are introduced in a hortatory manner reflective of the purpose of the pamphlet, which is to emphasize the social gains of transferring water to cities. That case is strong enough to need no exaggeration, but a byproduct might be to overstate the AP of labor, our present focus, in manufacturing. We therefore present the manufacturing

Revenue produced per kaf, by crop type: (pp. 1, 4, 5)

Field crops, $232k (= $232/af)

Vegetables, $1895k (= $1895/af)

Fruits and nuts, $944k (= $944/af)

Manufacturing, ? $387,000k (= $387,000/af) ?[7]

AP of labor (derived from above data):

Field crops, $155k

Vegetables, $95k

Fruits and nuts, $43k

Manufacturing, ? $149k ?[8]

Data are summarized in Table 1, below.

data bracketed with question marks (?).

[7]See note 6.

[8]See note 6.

Table 1: AP of Labor, inferred from water data

Land Use	Water Use (MAF)	Production (FTE)	Rev/kaf ($k)	Emp/kaf (FTE)	APL ($k)
Field crops	14.2	3.3	232	1.5	155
Vegs.	1.9	3.6	1,895	20	95
Fruits, nuts	5.4	5.1	944	22	43
Mfg.		?	387,000	2,600	149 ?[9]

Salient points from Table 1:

-- AP varies widely among land uses.[10]

-- AP of labor and land are inversely related. The AP of labor is highest in field crops, where the AP ("yield") of land is very low. The AP of water is also very low. As we move from field crops up to vegetables, revenue/af rises, but not as fast as jobs/af (manifesting the expected pattern of returns to labor in farming, i.e. positive but diminishing).[11]

-- The AP of labor is very high relative to the wages paid to labor,[12] in all uses. This indicates that on-farm labor does not receive a high share of the field-value of the crops. This kind of information, while partial, makes one wonder about the accuracy of standard national income accounts that show labor receiving the lion's share of national income.

[9]See note 6.

[10]Vegetables would have an even lower AP if tomatoes were excluded. The new harvester makes most of them (the "process" tomatoes) more like a field crop than a vegetable, economically. The tomato harvester lowered the "process tomato" workforce by 80% in twenty years, from 44,000 (1963) to 8,000 (1983) (p. 8).

[11]There is an apparent discontinuity in the data, jumping from crops to manufacturing. The high AP of labor in manufacturing doubtless reflects, among other things, the use of higher-skilled labor there, overall, plus the high cost of living in California cities.

There is also a possible bias in the data (n. 6). There is no question that the AP of *water* is higher in manufacturing, but it is possible the extra AP has been overstated, which would account for part of the reported higher AP of *labor* in manufacturing. It would be easy to overstate manufacturing productivity by taking gross sales, rather than value-added, as the measure of output; I suspect that is what was done, probably inadvertently.

[12]Annual wages are not given, but many of these farm enterprises pay minimum wage or less, using undocumented *illegales*.

The economic contrasts summarized in Table 1 are not new, but have grown more extreme in our times. From 1950-1990, farm labor hours in field crops on the West Coast have dropped more than 60%, despite higher output, due to greater use of machines and farm chemicals (p. 8).

Ordinary studies of labor "productivity," focusing exclusively on the AP of labor, have generally hailed these trends as signs of growing efficiency. There is repeated breast beating in the farm economics literature over how so few farmers now feed so many Americans. Giant mechanized, chemicalized farms are described as being the only genuine commercial farms; others are trivialized as "mom-and-pop" hobbies.[13] Use of the AP of labor as the criterion of efficiency totally masks the overapplication and low productivity of land and water that accompanies and causes the high AP of labor on big farms.

Even many of those economists who now signalize the low productivity of water in field crops seem to see the point only in a particular context, that of promoting water marketing.[14] Otherwise they evince "compartment-mindedness," seeming not to adjust their total system of thinking to the evidence that "labor productivity" alone is a wrong and misleading criterion of overall efficient management. The AP of labor can always be raised by wasting land and water; there is evidence that markets and institutions governing the distribution and allocation of land and water have done exactly that.

[13]It is common to cite the high productivity of small "garden plots" in Russia relative to the giant farms. The same phenomenon at home is treated with contempt.

[14]Many of them seem primarily interested in strengthening private property rights in water, with the benefits of marketing used as a trendy rationale. Forty years ago the same interests campaigned to strengthen property rights to *prevent* water transfers, which were then colored as a Communist conspiracy.