

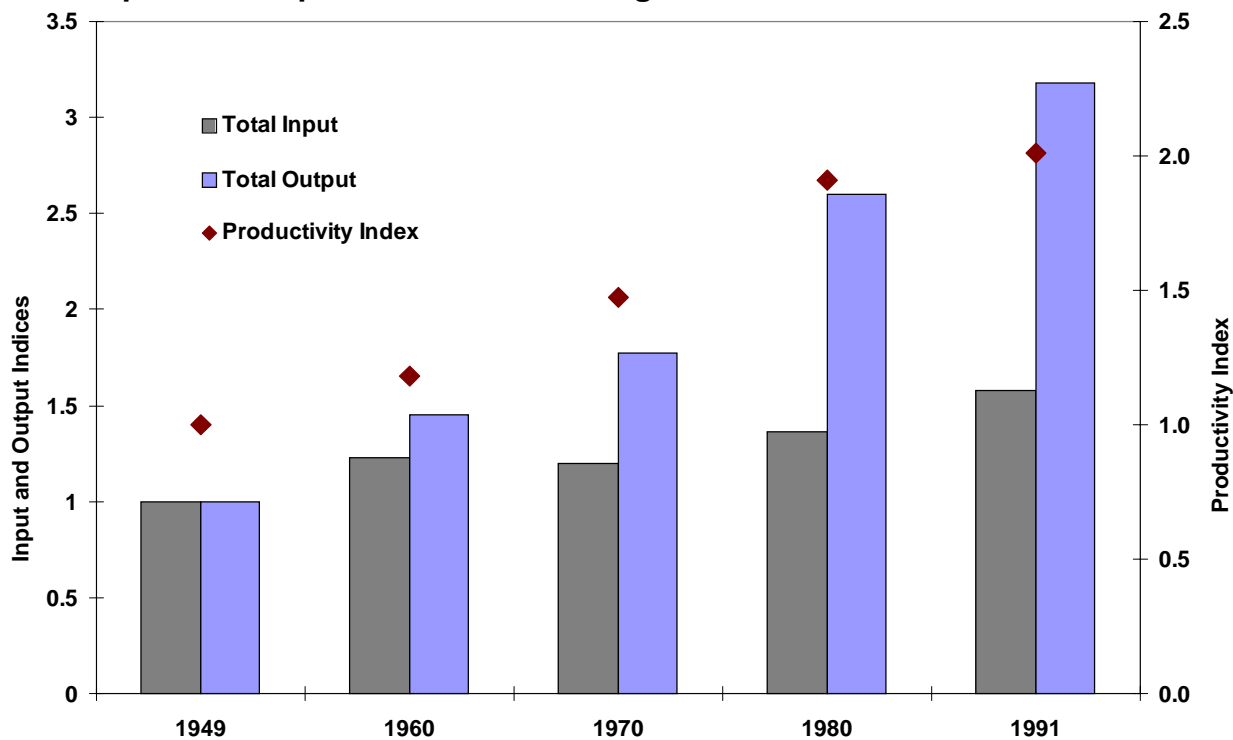
## II.5 Technology

**T**echnological innovation, fueled by research and entrepreneurship, has been a driving force in U.S. agriculture during the past century, leading to both higher yields and lower prices. In California, technological change has facilitated significant yield increases for many crops as well as other changes. Up to and through the late 1990's, inputs were used more efficiently to produce greater quantities of output. For instance, cash receipts (in constant 1996 dollars) per irrigated acre increased by 35% between 1960 and 1995. This can be attributed partially to the development and implementation of more efficient irrigation, such as drip systems, and partially to a change in the type of crops produced.

- The most recent analysis available finds that the productivity index for California agriculture (the index of total farm production outputs divided by the index of total farm production inputs) doubled between 1949 and 1991.

FIGURE 25

### Input and Output Use in California Agriculture



Source: Alston, Julian M, and David Zilberman, "Science and Technology in California Agriculture," *California Agriculture Issues and Challenges*, 1997.

TABLE 25

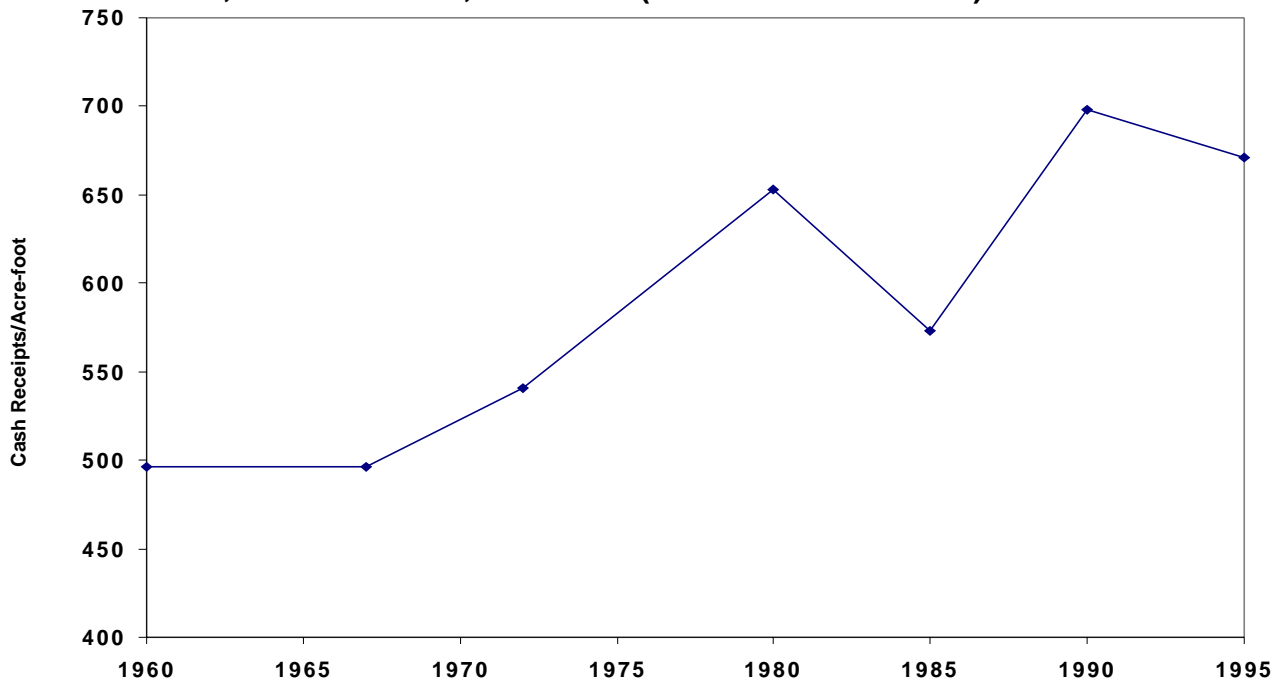
**3-Year Average Yield Per Harvested Acre, Representative Crops**

Crop	Units	1976-78 Average		1986-88 Average		1996-98 Average	
		Other 49 States	California	Other 49 States	California	Other 49 States	California
Corn for Grain	bushels	93	117	108	152	129	163
Cotton, Upland	pounds	393	880	556	1,121	628	1,082
Lettuce, Head	hundredweight	204	266	247	322	306	333
Rice, Med. Grain	pounds	4,111	5,483	4,948	7,439	5,955	7,583
Strawberries	hundredweight	60	405	99	495	130	570
Sugar Beets	short tons	19	26	20	26	21	30
Tomatoes, Processing	short tons	17	23	20	30	27	34
Wheat, Winter	bushels	26	52	30	72	43	66

Source: USDA, National Agricultural Statistics Service, *Agricultural Statistics*, selected years.

FIGURE 26

**California Agricultural Cash Receipts per Acre-foot of Applied Water, Selected Years, 1960-1995 (constant 1996 dollars)\***



\* GDP deflator from Bureau of Economic Analysis, National Income and Product Accounts, online data.

Sources:

- 1) California Department of Water Resources, *The California Water Plan Update*, Bulletin 160-98.
- 2) USDA, Economic Research Service, Farm Business Economics Briefing Room, online data.

- During the 1990s, particularly toward the end of the decade, computers were increasingly incorporated into farming operations. In only two years, between 1997 and 1999, the number of California farms with Internet access doubled to 46%. Overall, about 40% of California farms reported using computers in their business operations in 1999, compared to 24% for the United States as a whole. Colorado was the only state with higher usage than California, though Arizona reports a much higher share of farms with computer access.
  
- In 1998, California farmers invested \$2.4 million in computers to operate irrigation systems on 273,047 acres. About 675 farms reported using computer simulation models to decide when to irrigate<sup>3</sup>.

<sup>3</sup> USDA, National Agricultural Statistics Service, *Census of Agriculture, Farm and Ranch Irrigation Survey*, 1998.

TABLE 26

**Farm Computer Usage, 1997 and 1999**

	Farms with Computer Access		Farms that Own or Lease Computers		Farms Using Computers for Business		Farms with Internet Access	
	<b>Percent of Farms</b>							
	<b>1997</b>	<b>1999</b>	<b>1997</b>	<b>1999</b>	<b>1997</b>	<b>1999</b>	<b>1997</b>	<b>1999</b>
California	51	61	47	55	30	40	23	46
Arizona	46	80	42	75	35	39	16	44
Colorado	47	64	43	59	31	42	16	37
Iowa	46	51	37	45	25	32	12	30
Texas	41	48	32	39	21	23	18	31
<b>United States</b>	<b>38</b>	<b>47</b>	<b>31</b>	<b>40</b>	<b>20</b>	<b>24</b>	<b>13</b>	<b>29</b>

Source: USDA, National Agricultural Statistics Service, *Farm Computer Usage and Ownership*, 1999.