

Projection of California fertilizer use to 1985

Hoy F. Carman ■ Cris Heaton

California commercial fertilizer sales have grown dramatically since 1955. Total sales of nitrogen (N) and potash (K) tripled while phosphate (P) sales more than doubled. Total fertilizer sales of 830,000 tons for the year ending June 30, 1976 were distributed approximately 71 percent nitrogen, 22 percent phosphates, and 7 percent potash. The highly diversified and intensive cropping patterns characteristic of California agriculture will continue to require large amounts of fertilizer to maintain present levels of production.

Thus, it is not surprising that apparent fertilizer shortages in 1973 and 1974, accompanied by sharp price increases, raised doubts among California farmers, public officials, and others regarding fertilizer demand and the adequacy of future supplies. The purpose of this article is to project California's demand for nitrogen, phosphates, and potash which can be used to assess the adequacy of supplies in the coming decade.

Fertilizer demand

Analysis of the aggregate demand for fertilizer in California for the period

1955 to 1975 indicates that the demand for each nutrient is price inelastic. Large fertilizer price changes are necessary to significantly affect per acre application rates. For example, we estimate that a 10 percent increase in nitrogen price will decrease the quantity of nitrogen demanded by only 1.5 percent. Comparable price increases for phosphates and potash would reduce demand by 4.5 percent and 6.9 percent, respectively.

Expected crop income influences fertilizer demand, with recent experience being a strong factor in formation of price and yield expectations. For the period of analysis, a 10 percent increase in gross crop income per acre in one year was associated with a 4.2 percent, 4.4 percent, and 10.1 percent increase in per acre sales of nitrogen, phosphates, and potash, respectively, in the following year.

A combination of other factors also influences aggregate fertilizer demand. These include new crop varieties, increased irrigation, new technology, and expanded knowledge. Changes in these factors have created increased demand for fertilizer, although the annual rate of increase has declined in recent years. If this trend were to continue, and if fertilizer prices and crop income were held at 1974/75 levels,

we would expect the following increases in fertilizer application rates per acre in 1985 over 1975: nitrogen, 10.24 pounds; phosphates, 2.85 pounds; and potash, 0.14 pound.

Projections

Our procedure for projecting 1985 fertilizer demand was as follows. We estimated the trend in fertilizer usage rates caused by factors other than price and income changes for the period 1955 to 1975. Using this trend, 1973 usage rates for individual crops were adjusted forward to 1985. Then the adjusted use rates for each nutrient and crop were multiplied by projected 1985 crop acreage and summed over crops.

Crop acreage

Detailed projections of 1985 California crop acreage are from a recent study by King, Carter, and Dudek ("Projection of California Crop and Livestock Production to 1985," Giannini Foundation of Agricultural Economics Information Series No. 77-3, May 1977). The acreage projections are based on specifications regarding variables such as population, income, consumption patterns, competitive advantage, and technological change. Variables which change at a rate other than that specified will result in acreages which differ from the projections.

Total 1985 demand and estimated California production demonstrate significant increases for most crops. However, because of projected yield increases, increased demand can be satisfied with little increase in crop acreage. Projected crop acreage of 9.371 million acres in 1985 is 11 percent greater than average 1968 to 1972 acreage of 8.439 million acres, but slightly below 9.453 million acres of crops in 1975.

California Fertilizer Use: Estimated 1973 and Projected 1985
Total Use by Nutrient and Major Crop Category

Crop category	Fertilizer use					
	1973			1985 (projected)		
	N	P	K	N	P	K
	<i>tons</i>					
Field crops	247,484	68,350	10,348	313,587	82,301	11,809
Vegetables	64,282	28,972	12,684	73,484	32,594	13,353
Fruits and nuts						
Bearing	67,121	3,048	17,257	82,062	3,822	20,238
Nonbearing	9,521	417	2,404	6,886	312	1,582
Irrigated pasture	21,441	12,272	a/	21,441	12,272	a/
Range	28,228	29,868	a/	28,228	29,868	a/
Other crops	40,755	23,453	9,698	46,262	26,470	10,408
Total farm use	478,832	166,380	52,391	571,950	187,639	57,390
Nonfarm use	16,961	5,639	4,368	21,852	7,859	5,311
Total use	495,793	172,019	56,759	593,802	195,498	62,701

a/ No estimate available.

Application rates

Rauschkolb and Mikkelsen ("Survey of Fertilizer Use in California — 1973," UC Division of Agricultural Sciences bulletin, forthcoming) estimated common fertilizer application rates and percentages of land fertilized by area for individual crops in 1973. We derived weighted statewide application rates from these estimates. Thus, our estimates of application rates are based on the cropping pattern existing in 1973. A significant change in the location of crop production in California could produce a substantial change in fertilizer use without any change in fertilizer prices or planted acreage.

The acreage projections are based on increased average yields for most crops with the amount of increase dependent on recent trends. However, the interaction between fertilizer application rates and yields is not explicit. We assume that increased yields will require increased fertilizer applications and that our adjustments to the 1973 crop use rates will sustain increased yields.

Total fertilizer use

Estimated 1973 fertilizer use and projected 1985 use by nutrient and major crop category are presented in the table. We project a 98,000 ton (19.8 percent) increase in nitrogen, a 23,000 ton (13.6 percent) increase in phosphates, and a 6,000 ton (10.5 percent) increase in potash use in 1985. Approximately two-thirds of the increased nitrogen and 60 percent of the increased phosphates are for field crops. Just over one-half of the projected increase of potash is for bearing fruits and nuts. Nonbearing fruits and nuts show decreased use of all nutrients because of a projected decrease in nonbearing acreage.

The projected increase in the use of all three nutrients is 127,430 tons, which is 17.59 percent of reported 1973 sales in California. There are factors which could increase or decrease the projection. For example, increased crop income or increased crop acreage over that projected would tend to increase fertilizer use over the projection. Sharp increases in fertilizer prices could decrease projected usage.

Hoy F. Carman is Associate Professor of Agricultural Economics, and Cris Heaton is Research Assistant in Agricultural Economics, University of California, Davis.

Post-harvest codling moth infestations on pears— a potential threat for next year's crop

Helmut Riedl ■ James E. DeTar



Fig. 1. Photograph of pear orchard after harvest.