Using input-output models . . .

ESTIMATING ECONOMIC IMPACT OF INCREASING IRRIGATED FARMING IN COLUSA COUNTY

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THE USE of input-output models to analyze resource choices was discussed in *California Agriculture* (May 1973). This article briefly describes the application of input-output to estimating the economic impact of expanding irrigated farming in Colusa County.

County evaluation

In the spring of 1973, the Colusa County Board of Supervisors asked the University of California Cooperative Extension office for help in evaluating the economic effects of extending the Tehama-Colusa Canal. The county staff had previously worked with the Bureau of Reclamation preparing estimates of crop production changes expected when more irrigation water became available.

They estimated irrigated farming might expand by about 45,000 acres, while dryland farming could decline by about 44,000 acres. They also knew the total economic impact of this land use change was not fully revealed in the $14 million estimate given for the increased value of annual agricultural production. Other sectors of the economy would also grow. For instance, increasing livestock production causes increased purchases of feed, veterinary services, transportation and other inputs. People who sell to livestock producers also must increase their purchases, and so on throughout the economy.

The initial increase in sales is called the direct effect, and the additional sales stimulated by this initial increase is called the indirect effect. The sum of the direct and indirect effects is the total economic impact. Input-output provides a means of estimating the total expansion in all sales resulting from the initial increase in sales in a given sector.

To estimate the sum of the direct and indirect increases in sales caused by expanding irrigated farming, Colusa County's economy was divided into sectors. A set of multipliers was calculated which show the amounts that each sector's sales will change as the result of a change in another sector's sales. Using these multipliers, it was possible to find the total direct and indirect effects for the agricultural sectors (table 1). The second column in the table is the expected increase in value of farm production expected from extending the Tehama-Colusa Canal. The third column is the multiplier used—the sum of the direct and indirect increases in sales in the economy expected from a one dollar increase in the

TABLE 1. TOTAL DOLLAR EFFECT OF INCREASING FARM PRODUCT SALES BY $14 MILLION, COLUSA COUNTY

(1) Crop	(2) Increase in value of production	(3) Multiplier*	(2) × (3) Total increased sales in all other sectors resulting from the increase in production
Almonds	$1,427,400	2.04756	$2,922,700
Walnuts	674,520	1.92562	1,298,869
Prunes	3,710,735	2.39901	8,902,116
Sugar beets	1,493,514	1.38701	3,565,044
Tomatoes	3,134,174	2.25526	7,068,379
Rice	847,210	2.17838	1,845,545
Irrigated barley	– 90,215	2.03322	– 183,427
Milo	1,290,723	2.03322	2,624,324
Alfalfa	749,630	2.17766	1,632,439
Irrigated pasture	718,760	2.17766	1,565,215
Seed crops	1,260,000	2.21797	2,794,649
Beans	360,000	2.24306	807,505
Dryland crops	–1,334,217	2.03322	–2,712,768
	$14,242,234		$32,130,590

* Multiplier = The total increase of economic activity resulting from a $1 increase in sales of the sector named in column (1).

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EVALUATIONS OF WINE GRAPE VARIETIES FOR LODI. Bulletin 865. A long-term study was conducted to determine the suitability of certain grape varieties for table wine production in the Lodi area. An experimental test plot was established in 1960, and wines from each of the 22 varieties grown in the area were made and evaluated. This bulletin describes the experimental test plot, wine-making methods for small lots of wine, climate and soil determinations, must and wine analyses, viticultural descriptions and observations, and wine quality comments and evaluations.

value of crops produced in column one. The $14 million increase in value of farm production results in an additional $18 million increase in sales in the economy —yielding a total expansion of $32 million. The total also includes accounting for the decrease in dryland farming.

Sectoral effects

This framework of analysis permits detailed examination of the sources and the consequences of change. For example, it can be shown how much the increase in almonds or tomatoes, or some other crop, will cause the sales in each sector of the economy to increase. Each multiplier used in table 1 is really the sum of a set of multipliers, one set for each sector. This set of multipliers can be used to show how much a change in sales of any one crop will cause changes in sales in each of the other sectors of Colusa County's economy. Because of space limitations, only two crops, almonds and tomatoes, are shown (table 2).

Because the analysis provides individual sector multipliers, the Board of Supervisors and individual citizens can use it to evaluate any number of changes they may wish to consider. County groups or individual citizens can make assumptions about changes different from those discussed in the report. By using the individual multipliers, as shown above, they can estimate the pattern of sales change that would be produced by their assumptions. This type of analysis, showing the results of expected or hypothetical sales (or land use) changes, is useful in weighing and deciding on alternative county resource use policies.

Wider application

Recently, Professor Leontief of Harvard University received the Nobel Prize in economics for his work in developing input-output analysis for local, national and international use. The work reported here is based on his pioneering efforts. It was possible to respond quickly to the Colusa request because of experience gained from work on previous studies. Economic analysis with input-output permits better use of the knowledge and experience of the local Cooperative Extension staff. Thus, applications such as this one better equip the university-based and county-based extension personnel to provide local units of government valuable information for resource use decision making.

An input-output analysis can also be used for evaluating a vast assortment of economic changes, for example, the estimation of the impact of a new or expanded manufacturing firm, a hospital, a school, or a logging operation. It can also handle actual or assumed decreases in economic activity.

It should be emphasized, however, that input-output analysis is only one tool for appraising economic change. However valuable it is, it is not a substitute for all other information and analysis, nor for common sense. It allows for alternative resource use decisions to be compared on a quantitative basis. By so doing, it uses local information to facilitate economic planning.

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TABLE 2. ANALYSIS OF ADDITIONAL SALES CAUSED BY INCREASED ALMOND AND TOMATO SALES, COLUSA COUNTY

	Sector*	Multiplier	Increase in sales resulting from the $1,427,400 increased almond production	Multiplier	Increase in sales resulting from the $3,134,200 increased tomato production
1	Mining	.0110	$ 15,700	.0100	$ 31,300
2	Construction	.0083	11,800	.0091	28,400
10	Furniture	.0055	7,900	.0072	22,600
11	Printing and publishing	.0068	9,700	.0107	33,500
12	Chemicals	.0135	19,300	.0155	48,600
13	Primary metals	.0042	6,000	.0050	15,600
14	Fabricated metals	.0130	18,500	.0170	53,400
15	Transportation	.0058	8,300	.0062	19,500
16	Communication	.0064	9,100	.0085	26,600
17	Utilities	.1176	167,900	.1044	327,200
18	Trade	.1445	206,300	.1406	440,800
19	Finance	.1039	148,300	.1275	399,600
20	Services	.1045	149,200	.1725	540,100
21	Households	.5025	717,300	.6210	1,946,300
29	Tomatoes			1.0000	3,134,200
32	Almonds	1.0000	1,427,400		
	Total	2.0476	$2,922,700	2.2553	$7,068,400

* Those sectors with zero or near-zero increases are excluded.

Controlling

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POWDERY MILDEW OF ROSE, caused by the fungus, *Sphaerotheca pannosa*, results in unsightly leaves and flowers, and may reduce growth. Several new fungicides were evaluated for the control of powdery mildew in southern California rose gardens, and are reported here.

Spring trial—1972

Rose plants of several breeding lines obtained through the courtesy of Armstrong Nursery, Ontario, were used for the treatments. Each treatment was replicated four times, using 15 rose plants per replicate. Powdery mildew was present in the plots before application of the first spray.

Fungicide treatments with rates of materials per 100 gallons of water were: Eli Lilly 273 7.2%, 50 ppm; Afugan 30%, 6 oz; Triforine 20%, 10 oz; and Benlate 50W, 8 oz. Sprays were applied to runoff with a 2-gallon pressurized Hudson sprayer at 40 psi. Applications were made on April 4, 18, May 1, 16 and 30 (an approximate 14-day spray schedule). Disease symptoms were rated on a scale of 0 to 4 on June 19—a "0" rating indicating no disease symptoms, while a "4" rating indicated mildew completely covering both sides of the leaves and numerous mildew colonies on petiole and stem. Results of this trial are shown in table 1. Applications of El 273 and