

Clean Water in California: What is it Worth?

by

Douglas M. Larson and Daniel K. Lew

California has been, and continues to be, a magnet for population and industrial growth. The problems this poses for environmental quality have been well-documented, particularly for air pollution. For example, efforts by both California and federal regulators to reduce the growth in emissions from automobiles and, more recently, heavy trucks and sport utility vehicles, have been widely publicized in print and broadcast media.

Less well-publicized, perhaps, are the problems California experiences with water quality. While many specific (or “point”) sources of water pollution have been identified and are subject to regulation under the Clean Water Act, water quality problems

persist and are severe in some localized areas. A main contributor to these problems is pollution that cannot be traced back to a specific source (often called “nonpoint” source pollution), which is principally caused by urban runoff, forestry activities and agriculture.

To help address these problems, water quality objectives are established for each water body within the state, including rivers, streams, lakes and reservoirs, ponds, estuaries, wetlands, beaches and other coastal areas. The California State Water Resources Control Board, the principal state agency with responsibility for managing water quality, has identified specific uses of water for each water body. These “beneficial uses” of water (26 in all) range

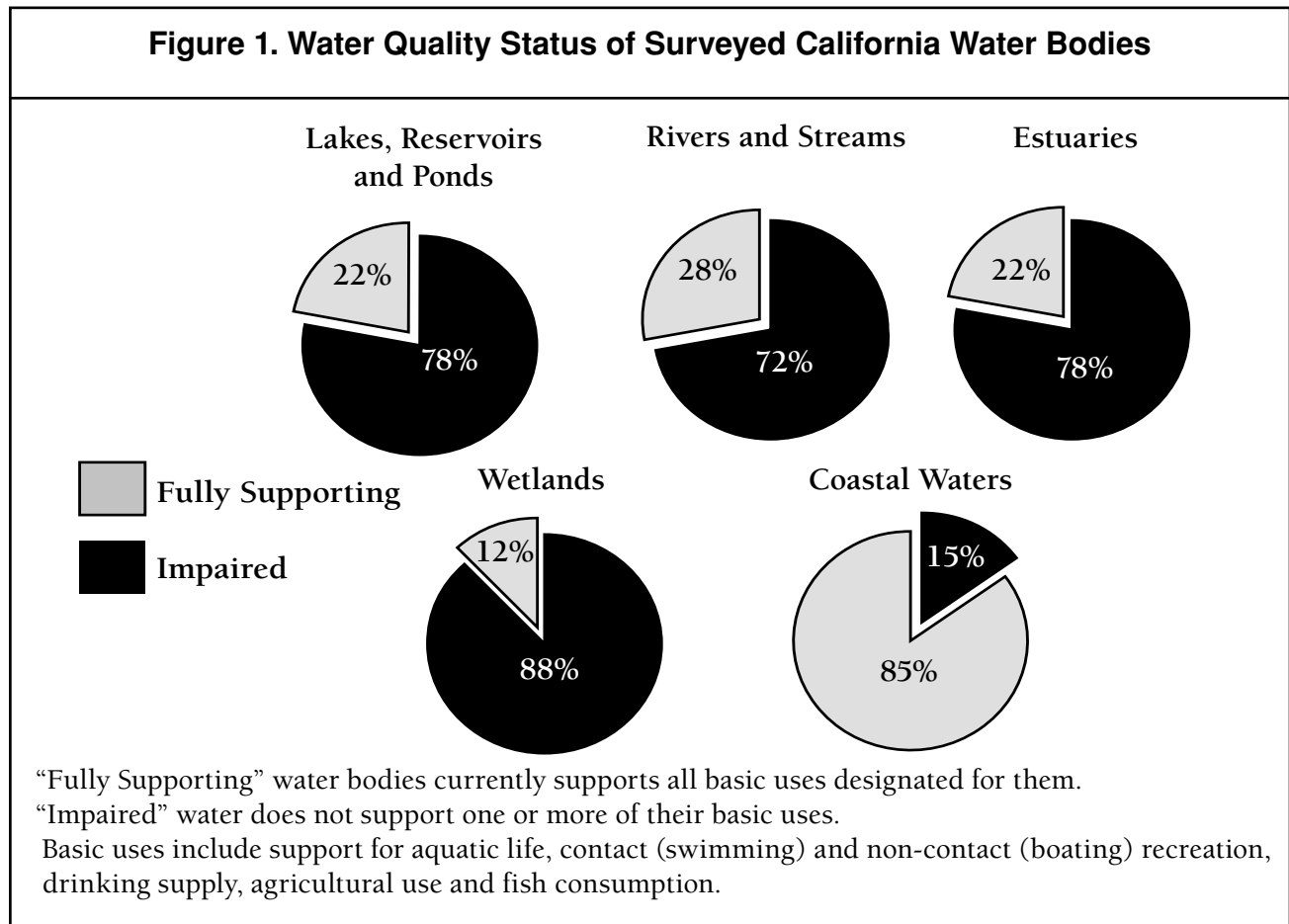
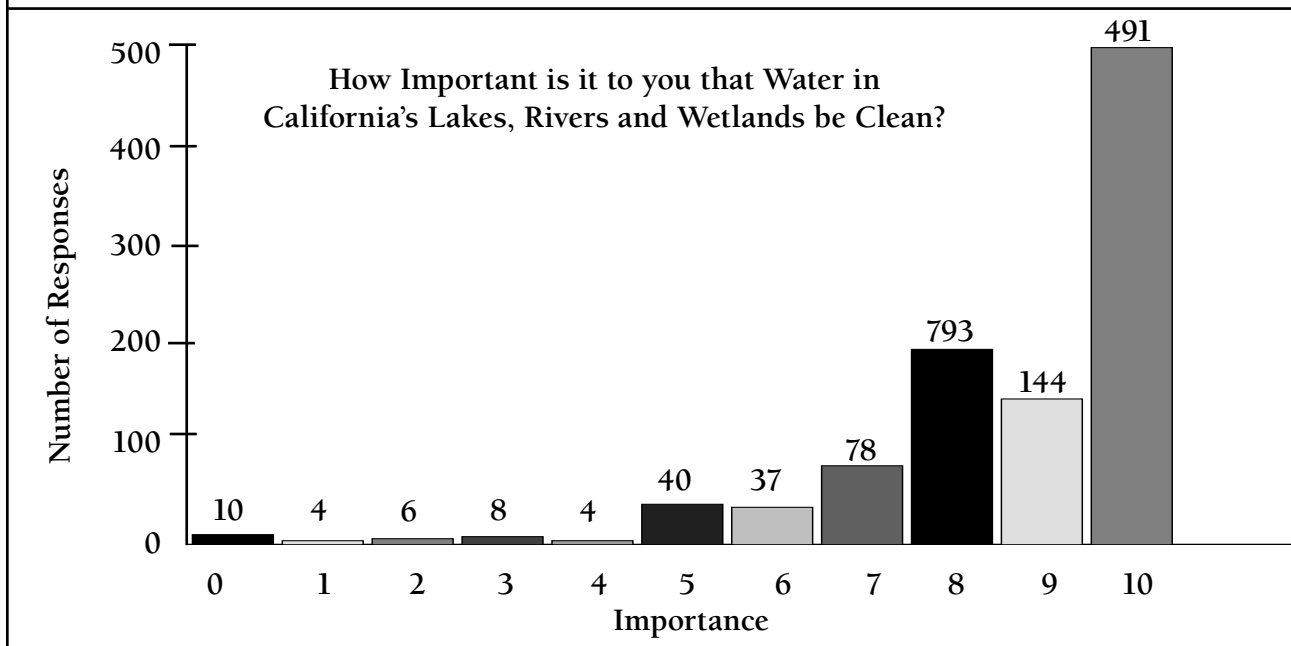


Figure 2. Respondents' Ratings of the Importance of Clean Water



from use in agriculture and ranching to navigation, hydropower, support of habitat and ecosystems, recreation and drinking water supply. Naturally, not all beneficial uses occur at every water body.

Every other year California, like other states, reports to the United States Environmental Protection Agency (EPA) on the quality of waters throughout the state. This comprehensive report identifies which water bodies in the state meet the water-quality objectives established for them, and which do not. Water bodies are considered *impaired* if one or more beneficial uses established for them cannot be supported due to the presence of pollutants such as bacteria, chemicals, metals, oil and grease or trash. According to the latest report in 2000, over three-quarters of the state's estuaries, wetlands, streams and lakes are designated as impaired (Figure 1).

While designation as impaired does not indicate the severity of water quality problems at specific water bodies, the high proportions of impairment suggest that maintaining and improving water quality is an important problem in much of the state. Only coastal waters are relatively free from impairment, though coastal water quality is also a problem periodically in Southern California.

California citizens benefit from having better water quality because beneficial uses of different water bodies are restored in the improvement process, and these generate value for both firms and individuals. But making those improvements can be expensive, whether because of the need to retrofit storm drains, forego some uses of environmentally sensitive land or to build new water-treatment facilities. Ultimately, publicly funded projects such as these are paid for by the people. The operative question, then, in deciding how far California should go to improve its water quality is "how much?": What is the right level of water quality to seek?

One of the necessary pieces of information to answer this question is how much the people of California value water quality improvements. Unfortunately, relatively little information is available on this important topic, so we conducted a survey of the California public during the fall of 2000.

Since so little is known about the value of improved water quality in California, the survey was designed to provide some information on the "big picture" question: what would it be worth to Californians to have all impairments to water quality removed from all water bodies? The value of such a comprehensive program of improving water

quality would represent an upper bound to the value of other smaller projects that focus on a subset of water bodies or that do not fully remove impairments. A random sample of 2,000 California households was mailed a packet containing an eight-page booklet, a cover letter explaining the purpose of the survey and seeking the household's assistance, and a postage-paid return envelope. The survey was conducted following the principles of the Total Design Method (Dillman, Don A., *Mail and Telephone Surveys: The Total Design Method*, New York: John Wiley and Sons, 1978). This method included early versions of the survey shown to experts in resource valuation and water quality engineering, four focus groups, a pre-test, and three mailings plus a reminder postcard in the survey itself. The response rate, measured as the percentage of deliverable surveys returned, was just over 60 percent.

The survey consisted of three parts: a few general attitudinal questions about the environment, the questions on willingness to fund water quality improvement programs, and a few demographic questions that permit us to adjust for non-response and extrapolate sample results to California.

Most people rated environmental quality generally, and clean water in particular, as highly important. Figure 2, which is typical, shows that 48 percent (491 of 1015) rated the importance of clean water as 10 on a scale of 10, and 82 percent rated it at least 8 on a scale of 10.

However, a bottom-line measure of how much importance people attach to clean water is how much they're willing to pay for it. "Willingness to pay" is the standard measure of economic value, both in market settings and for non-marketed goods such as water quality improvements. To gauge this, the central part of the survey described programs that would remove impairment to California's water bodies, funded by a surcharge on the monthly water bill of each business and household. People were asked a simple yes-no question: would they pay a specified surcharge to fully remove impairment to California's sources of water? They were reminded

Table 1. Monthly Surcharge Threshold Levels

Variable	Mean	Lowest	Highest
Initial surcharge	\$41	\$20	\$60
<i>(If yes to initial)</i> High surcharge	\$73	\$50	\$90
<i>(If no to initial)</i> Low surcharge	\$16	\$5	\$30

that what they agreed to pay would reduce their monthly budget available to spend on other items, and that they should tell their own willingness to pay rather than what they thought a fair price would be. The surcharges we specified were varied across households, for statistical reasons.

The advantage of a simple yes-no question for paying for a program is that it is relatively easy to answer. However, it is not very precise. To make the information on a household's willingness to pay more precise, the initial surcharge question was followed by a second question to gather a little more information. Those who said "yes" to the initial surcharge were then asked whether they would pay a higher surcharge (the "High Surcharge"), while those who said "no" to the initial surcharge were asked whether they would pay a lower surcharge (the "Low Surcharge"). These values also varied randomly across households. The mean values of the surcharges used are given in Table 1.

The responses to the surcharge questions were analyzed in statistical models that allowed the household's income, education level and degree of environmental concern to influence their willingness to pay a monthly surcharge. The environmental concern variable is the sum of the ratings on two questions tracked in the California Field Poll, each ranging from 1 to 4, with 4 signifying the greatest environmental concern.

Each of these factors was highly significant statistically and had a positive effect on household willingness to pay. Based on these results, the average monthly household willingness to pay to remove all impairments to California water bodies was \$23 for the sample, with a margin of error of plus or minus \$8.80 for 95 percent confidence; that is, we are 95 percent confident that the true willingness to pay lies with the range of \$23 - 8.80 and \$23 + \$8.80, or \$14.20-\$31.80. The effect of an additional \$10,000 in household income is an increase

of \$2.08 per month, and similarly, an increase of one year of education by the respondent increases household willingness to pay by a little over \$2 per month. An increase in the environmental concern index of 1 point, comparable to going from somewhat concerned to “extremely concerned” on one of the environment questions, increases household willingness to pay by \$10 per month.

Due to the importance of income, education and environmental attitude to household willingness to pay, differences in these variables between the sample and the population of all California households need to be accounted for in developing a statewide estimate of willingness to pay. The differences between the sample and the state as a whole are summarized in Table 2, which shows that the sample has considerably higher household income and more years of education than the average household across the state. The level of environmental concern in the sample is only slightly higher than for the state as a whole.

When the adjustments for differences in income, education and concern were made, the estimate of willingness to pay for the average California household dropped from \$23/month to \$15.46/month (Table 3). Considering that the preliminary estimates from the 2000 census indicate that there are approximately 12.1 million households in California, this translates to an aggregate willingness to pay of some \$2.24 billion per year to remove impairments to water quality from all California water bodies.

Interested in More on Economic Values of Water?

You can read the full report that describes the survey and more detail about the results just presented by either sending a request to

Variable	Household Income (\$/year)	Years of Education	Environmental Concern Index (Range 2-8)
Sample Mean	\$70,600	15.2	7.0
Population Mean	\$47,700	12.9	6.9

Calculated from U.S. Bureau of Census data for 1990 Census, 1997 Census data and 1997 California Field Poll results.

Willingness to Pay	Estimate
Per household, monthly	\$15.46
Total Statewide, annually	\$2.24 billion

ARE Update, or by downloading it online from <http://www.agecon.ucdavis.edu/Faculty/Doug.L/Larson.html>. Also, we have been collecting information from the published literature on the economic values of water for the 26 beneficial uses designated by the State Water Resources Control Board. The data base now consists of some 2,034 unique value estimates, and is available online at <http://buvd.ucdavis.edu>. The alpha version of this data base, in Microsoft Access, will be revised based on comments by users, so be sure to let us know if you have suggestions for improvement (a form for doing this is also online).

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The Organic Foods Production Act: How Will Implementation Change the Face of California's Organic Agriculture?

by Karen Klonsky

The Organic Foods Production Act (OFPA) of 1990 requires the USDA to develop national organic standards for organically-produced agriculture. The final regulations for implementation of the OFPA were published in the Federal Register in December 2000. The new rule took effect April 21, 2001 and marked the beginning of the transition period. Full compliance with the rule will be required by October 20, 2002 in order to use the word "organic" in marketing. At that time, products can begin to use the National Organic Program organic seal label.

Arguably, the single most important difference between the federal law and the California Organic Foods Act of 1990 (COFA) relates to certification. OFPA requires all growers grossing over \$5,000 to be certified by a USDA-accredited certifier, while COFA does not require certification for any growers. Among other things, organic certification means that a farmer must have an organic farm plan, maintain a paper trail for materials applied, and undergo an annual farm inspection by an accredited certification organization.

This article looks at the composition of organic agriculture in California to discuss how the implementation of the federal organic rule will impact California's organic growers by projecting from the current composition of organic production, income concentration, levels of certification and patterns of entry and exit in organic production. The data used in this article are derived from the registration forms required by COFA of all growers, handlers and processors of food labeled as organic. The most recent figures available are from 1998.

Organic Production in California

Over 70 commodities are produced and marketed as organic in California. Produce, including vegetables, fruits and nuts, dominates the organic farm sector with over 90 percent of total sales, 89 percent of farms and 74 percent of acreage. Although produce contributes 50 percent of gross sales to California agriculture as a whole, it is more important to the organic subsector.

California organic agriculture expanded rapidly throughout the 1990s, with double digit growth in registered acreage and sales. Growth of organic agriculture using these measures was considerably faster than growth in California agriculture as a whole. However, \$160 million of organic agriculture in 1998 accounted for only 0.8 percent of all crop sales and a much smaller percentage of livestock and livestock product sales.

Most registered organic farms in California are small in acreage with low annual sales per farm. In 1998, 50 percent of all organic farms consisted of five acres or less and reported gross sales under \$8,000. These results reflect a large segment of the industry

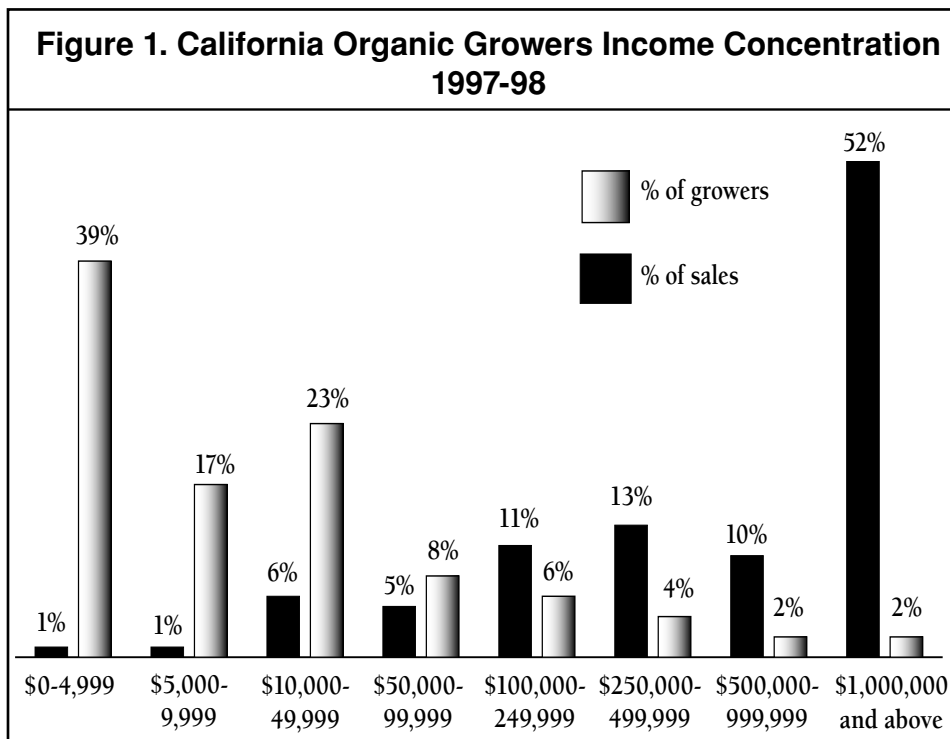
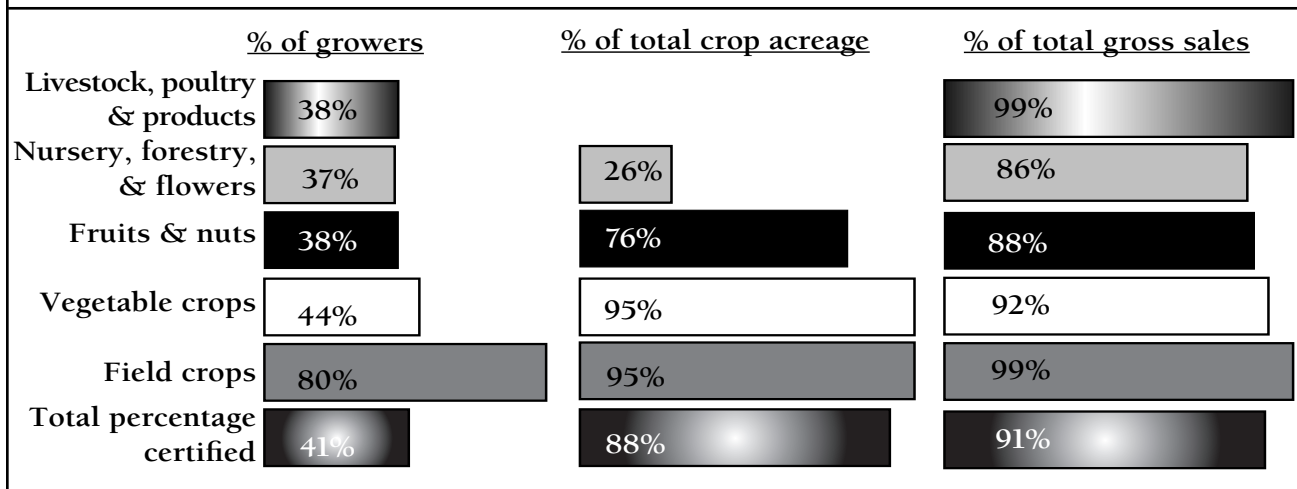


Figure 2. Percentage of Registered Organic Growers, Acres and Sales that are Also Certified, by Commodity Group



comprised of small or part-time growers, who undoubtedly use organic farming as a means of supplementing income.

Registered organic agriculture is highly concentrated. Only 10 percent of farms grossed over \$177,000. Registered farms that grossed over \$1 million annually represented less than 2 percent of the total number, but captured over half of the state's total sales in 1998 (Figure 1). Another 6 percent of all growers, those who grossed between \$250,000 and \$999,999 annually, claimed an additional 23 percent of the state's sales. At the low end of the scale, over half of all farms grossed less than \$10,000 and realized just over 2 percent of all sales in the state.

Over 75 percent of all farms in the lowest sales classes, those earning \$10,000 or less, grew fruit and nut crops, representing two-thirds of all fruit and nut growers. Over half of vegetable crop growers earned less than \$10,000 annually. However, of the growers who grossed over \$1 million, over three-quarters were vegetable crop growers.

Certified Farms

Currently, about 40 percent of all registered organic growers are also certified. Within commodity groups, field crop farms were more likely to be certified than vegetable or fruit and nut farms, undoubtedly because they are rarely direct-marketed (Figure 2). Eighty percent of field crop farms were certified, compared to only 38 percent of fruit and nut farms and 44 percent of vegetable farms in 1998. Field crops are more likely to be certified than produce with respect to acreage and sales. It is worth noting that 88 percent of fruit and

nut sales and 92 percent of vegetable crop sales were certified, reflecting the fact that most uncertified growers are small produce growers who make up over half of the organic growers, but realize only 2 percent of total sales.

Farms with higher gross sales are more likely to be certified, with 100 percent of the farms grossing over \$1 million being certified, but only 30 percent of farms grossing between \$5,000 and \$10,000 holding some form of certification. Certified farms, though representing less than half of registered farms, accounted for more than 80 percent of the registered acreage and about 90 percent of the registered sales in the state.

Several explanations are possible for this difference in certified farms and registered organic agriculture as a whole. First, small farmers may consider the increase in sales gained from certification, if any, insufficient to justify the cost to certify. Second, incentives for certification may be greater for larger scale operators who are less likely to market their products directly and more likely to sell to processors, wholesalers or retailers who usually require certification. Finally, certification itself may improve the prospects of a farm through greater market recognition, greater access to markets or enhancement of production and marketing skills through information exchange among farmers, agencies and other partnerships.

Patterns of Entry, Exit, and Expansion

Although there were only 100 more registered organic growers in 1998 than there were in 1995,

Table 1. Entry and Exit Patterns of California Organic Growers, 1995-96 to 1997-92

	Number of growers		
	1995-96	1996-97	1997-98
Registered organic growers			
Continuing from previous year	1,092	1,126	1,190
Entering	335	349	343
Total number of organic growers	1,427	1,475	1,533
Exiting at the end of year	301	285	na
Continuing into the next year	1,126	1,190	na

looking at entry and exit from the ranks of the registered organic growers reveals that almost one-fourth of the growers are new in any given year and that about one-fifth of registered growers drop out of the program every year. About 340 growers are new every year and about 290 drop out every year (Table 1). Most of the growers coming in and out of the program gross less than \$50,000, although several growers enter the program with sizable acreage and sales. As a result, the number of organic growers increased by only 7 percent from 1995 to 1998, and the number of organic acres increased by 47 percent.

Discussion

When implemented, the federal Organic Foods Protection Act will require growers grossing over \$5,000 per year to be certified. This will impact registered organic growers who are not certified but will seek certification for the first time, as well as new entrants into organic production. In 1998, there were roughly 400 uncertified growers who would have required certification under the new rules, 95 per cent of whom grossed between \$5,000 and \$50,000. Certification for these growers could cost \$2,000 or more depending on the complexity of their operations and the certifier they choose.

Growers who are exempt from certification by the organic rule will be allowed to use the word organic in marketing but will not be allowed to use the USDA organic seal. Therefore, they may find themselves competing side by side with organic products bearing the USDA organic seal, which could put them at a disadvantage in farmers markets or natural foods stores.

The cost and paperwork involved in certification will inevitably drive some organic growers out of the market altogether. These growers may instead

use some other sort of green label such as “pesticide free” or “sustainably grown” that are currently not regulated. For new growers, the certification requirement could act as a barrier to entry into the organic market, particularly for growers grossing between \$5,000 and \$50,000 per year. There

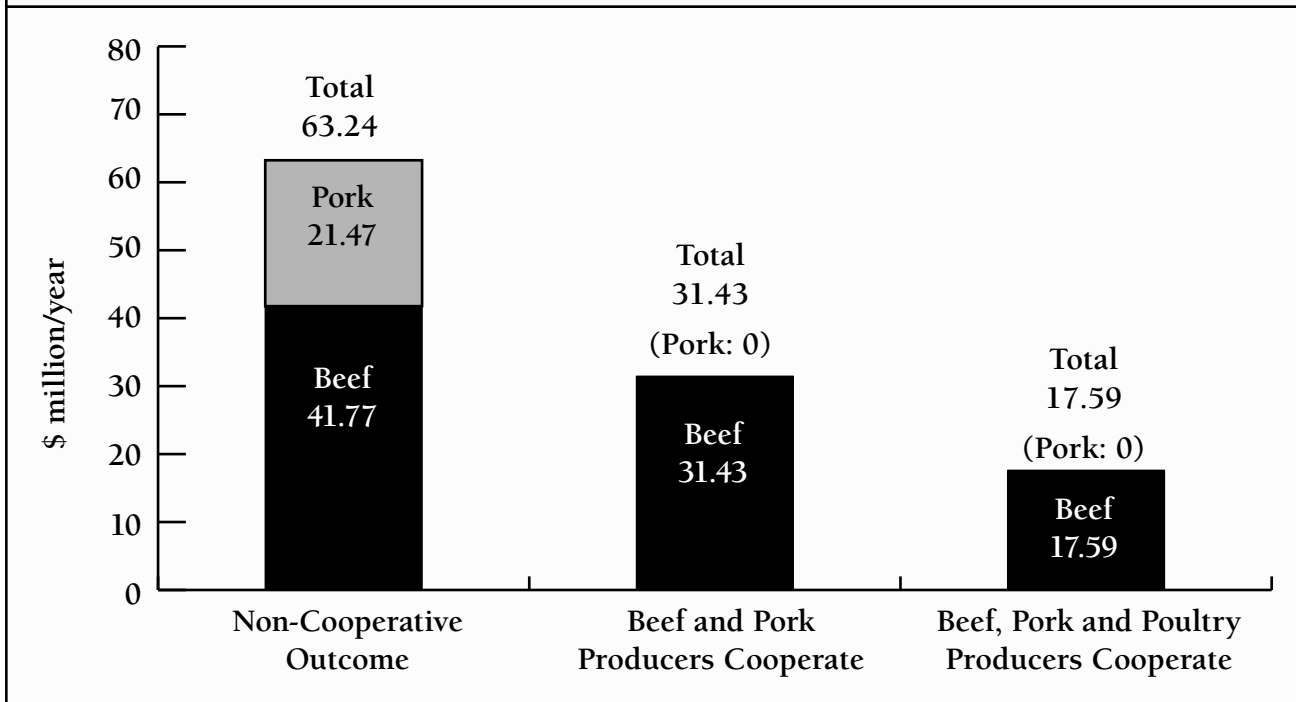
have been over 300 new organic growers every year since the California organic program began. These new entrants might also seek another green marketing niche.

Further, the new rule creates uncertainty as to which certifiers will be in operation in 2002. Certifiers must apply for accreditation to the National Organic Program (NOP) by October 20, 2001. No doubt some certifiers may decide to cease operation rather than go through the NOP process, leaving their clientele to search for a new certifier. Therefore, there are several reasons why farmers will be seeking a certifier. They may never have been certified before, they may need to change certifiers because the current certifier does not gain approval by USDA, they simply want to change certifiers, or the certifier goes out of business. But the list of approved accredited certifiers will not be released before April 21, 2002. This will leave these farmers six months to be certified by another certifier in order to be certain of meeting the October 20, 2002 deadline for compliance. Other new certification organizations will no doubt appear that have no track record, creating more uncertainty for organic farmers.

The true impact of the National Organic Program standards, now finalized, will not be known for several years. Also not clear is how broader legislation concerning food-quality protection, water quality, biotechnology, international trade and a host of other issues will be felt by the organic subsector.

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Figure 1. Optimal Advertising Expenditures



PROMOTION- continued from page 2

producers would spend much more on advertising (\$42 million, 0.08 percent of revenue) under non-cooperative competition than the amount that would maximize joint profits with pork producers (\$31 million, 0.06 percent of revenue) or, even more so, joint profits with pork and poultry producers (\$18 million, 0.03 percent of revenue). For pork producers the relationship is in the same direction but more pronounced: they would spend a significant sum on advertising under non-cooperative competition (\$21 million, 0.06 percent of revenue), but would not advertise at all in either of the cooperative scenarios. Considering the combined expenditure of beef and pork producers, under non-cooperative competition collectively they would spend \$63 million (0.07 percent of revenue). In the cooperative case they would spend \$31 million (0.04 percent of revenue) to maximize their combined profits ignoring poultry producers, or \$18 million (0.02 percent of revenue) if they maximized joint profits including poultry producer profits.

Table 1 also includes information (and Figure 2 provides a visual depiction) on the annual changes in producer profits relative to a no-advertising base for each assumption regarding producer cooperation. Under each scenario, gains to beef and pork

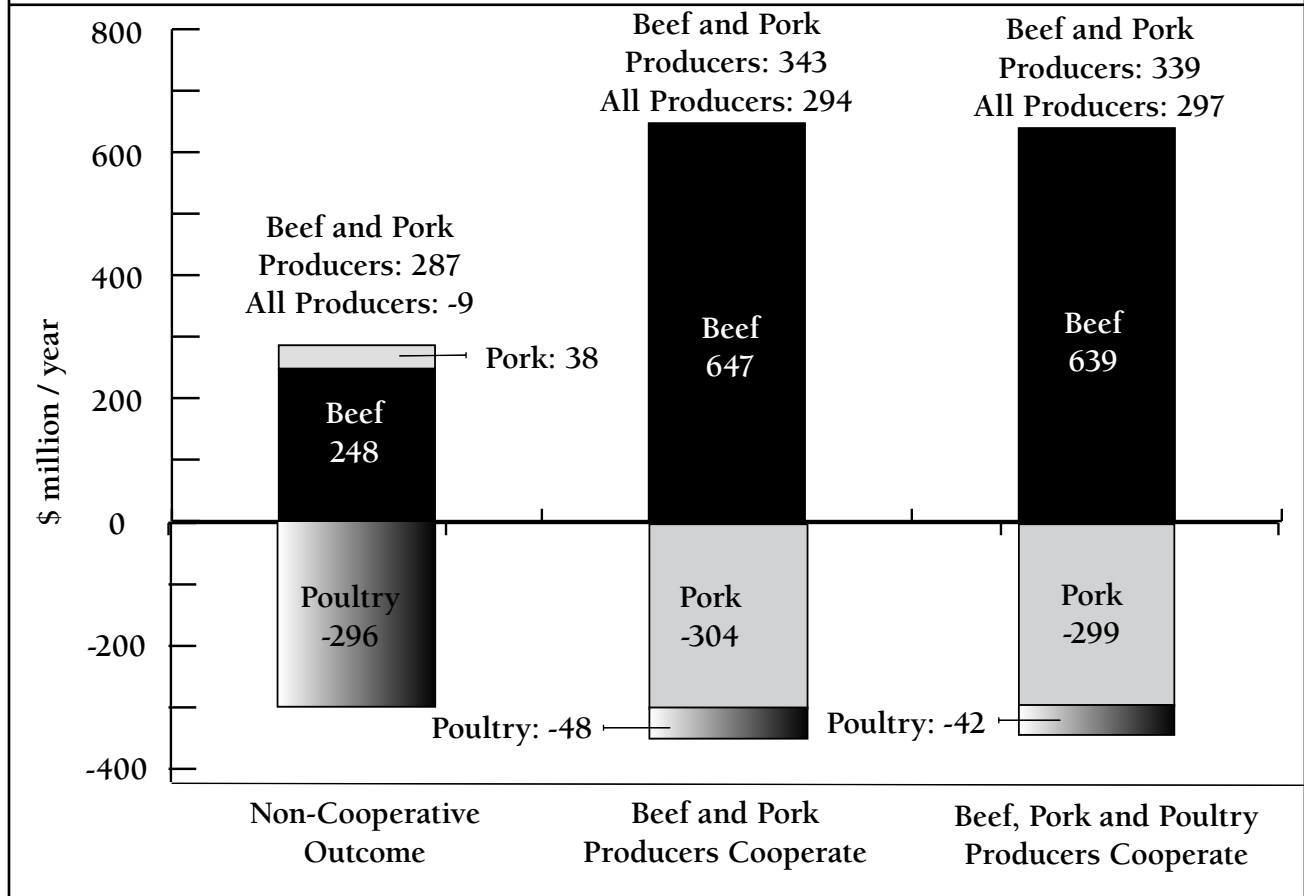
producers come partly at the expense of poultry producers. Under the non-cooperative scenario, the losses to poultry producers exceed the gains to beef and pork producers, causing a net loss to meat producers from advertising of \$9 million per year. When beef and pork producers cooperate, their net annual benefit rises to \$343 million compared to \$287 million under the non-cooperative outcome. However, pork producers lose money under this arrangement and would have to be compensated for these losses if they were to voluntarily cooperate with beef producers. Adding poultry producers to the cooperative solution raises total benefits only slightly, \$297 million versus \$294 million, relative to the outcome involving cooperation only between beef and pork producers.

Comparing the cooperative and non-cooperative scenarios, the difference in total profits (across all producers) from generic advertising is a measure of the producer loss from beggar-thy-neighbor behavior: a loss of \$9 million per year compared with a potential gain of \$297 million per year.

Conclusion

Marketing-order type arrangements for collective action are economically justified when, absent

Figure 2. Benefits from Advertising



government intervention, there would be an underinvestment in certain goods from a social perspective. It seems likely that there have been net benefits to society as a whole from the provision of applied research, grades and standards, and market information through collective action programs. It is less clear that, absent government intervention, the private sector would underinvest from society's viewpoint in generic commodity advertising and promotion. Nevertheless, the policy prescription has been to create institutional arrangements for collective action in commodity promotion, funded by check-offs, mandated by producer referendum.

Even if there would have been an underinvestment otherwise, our analysis indicates that the cure (collective action under mandated programs) may be worse than the disease (individual underinvestment from the collective viewpoint). Once a marketing order is established, individual producer groups are likely to overinvest in promotion from the viewpoint of a larger group, including producers of

related commodities. In our empirical example, the beggar-thy-neighbor effects were large. Our results imply that more care should be taken in authorizing and evaluating generic promotion programs. When only a subset of affected producers are eligible to vote on authorizing a program, net benefits to that subset are only part of the story. In determining whether to approve particular programs, specific consideration ought to be given to the extent of the beggar-thy-neighbor aspect, if the relevant criterion is net benefits to all producers.

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