control plans for 16 hydrologic basins of California. The plans demonstrate that the relationship between quality and quantity becomes increasingly significant as more water is diverted from the streams and as water is used more intensively.

In accordance with the provisions of the Porter-Cologne Water Quality Control Act, the basin plans now constitute the water quality control element of the California Water Plan. In 1978 the DWR and the State Water Resources Control Board will issue a joint report to the legislature updating the California Water Plan. This will be the first time that the two major elements of the plan—water management and water quality control—are combined in a single document.

The Department of Water Resources believes it is essential that California's needs for water supplies, water-related recreation, fish and wildlife enhancement, hydroelectric power, prevention of damage and loss of life from floods and dam failures, and water-related environmental enhancement be effectively and economically fulfilled. The manner in which these needs are met must be consistent with public desires and attitudes concerning economic, environmental, and social considerations.

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Local planning for future water supplies: Santa Barbara County case study

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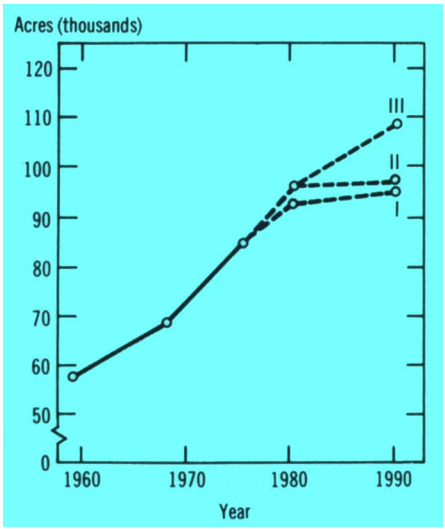
Planning for water supply and for land use in agricultural areas has taken on new significance with enhanced public environmental awareness, new anti-pollution legislation, high costs of construction and energy, and increased economic opportunities for specialized agricultural commodities.

Conducting such interdisciplinary planning programs in the full light of public involvement calls for new planning and educational techniques. The Santa Barbara County board of supervisors faced such a problem in making two crucial decisions: (1) revising the county's general land use plan and (2) negotiating with the California Department of Water Resources and others on future water supplies.

Since the two planning projects were interrelated and concurrent, it seemed logical to combine the tasks of collecting data and preparing reports. Such an integrated approach was particularly important to agriculture, because irrigated agriculture's future depends on both appropriate land use planning and an adequate water supply.

Santa Barbara County has numerous small coastal valleys with limited surface and underground water supplies. Irrigated cropland is scarce, totalling 85,000 acres or only 5 percent of the total land in the county. Much of this prime land is close to the expanding urban centers. The need to preserve agricultural land and to protect the underground water supplies is recognized by both urban and rural residents.

At the time this program was begun, however, little factual information was available on which to base intelligent



Above: Total irrigated cropland with projections for alternative water-supply policies. Santa Barbara County. I.As is—continue to use present sources, including moratoriums and overdrafting. II.Local development—small dams,recharging, reclaimed water, conjunctive use, cloud seeding. III. Imported State Project water.

Left: Santa Barbara County's numerous small coastal valleys have limited surface and underground water supplies, and irrigated cropland comprises only 5 percent of the total land in the county.

decisions. Emotional stands were being taken on all sides of the issues. Several water districts had adopted moratoriums on new construction because of water-shortage emergencies and also had opposed importation of State Project water—seeing these as the only effective ways to control population growth. Some residents concluded that land use planning was ineffective in stopping urban growth; others urged rapid adoption of a new comprehensive plan, with water supply planning to follow later on. Other issues involved reclaimed sewage water, overdrafting of underground water basins, rights to divert surface waters, pollution, provision of high-quality domestic water, and cloud seeding.

There were two other important aspects of the situation:

■ Since the water supply situation was different in various parts of the county, separate information had to be developed for each of eight water basins.

■ Economic opportunities existed to expand production of certain high-income specialty crops. Suitable soil and climate were available; the only missing ingredient was water. Crops such as avocados, premium table wine grapes, strawberries, and most ornamental and flower crops might be able to pay the apparent high cost of importing additional water.

Collecting information

The county retained a private consultant to do the comprehensive plan studies. Another consulting firm, later replaced by a newly formed County Water Agency, studied the water supply situation. The initial goal was to get most useful information for the least effort and cost, assuming that more technical studies would be required later on.

Because most professional planners have limited expertise on rural areas and agriculture, the question arose: Who could assist with the necessary data development and educational work in rural parts of the county? It was decided to bring the resources of the University of California to bear through Cooperative Extension, and for local farm advisors to work with the professional planners and water resource authorities. Graduate student interns, most from the Urban Economics Program at nearby U.C., Santa Barbara, were used to meet the expanded staff requirements.

The following information categories were chosen as the minimum needed for early planning purposes:

1. Current crop acreages. Remote sensing was the method chosen, with the Geography Remote Sensing Unit at U.C., Santa Barbara, conducting the work and with "ground truth" provided by farm advisors and a student intern from U.C., Davis. Accuracy of the high altitude, false-color, infrared aerial photography proved adequate for the study.

2. Economic effects of resource use by the private sector. An economic input-output study of the county was made, using a regional model program developed by U.C. Cooperative Extension. The study was completed for the base year 1973, using 41 sectors—26 of which were agricultural.

3. Economic impacts on public services. Impacts of changing land uses on the cost/revenue situation of local governments are an essential consideration. Several typical land sites were studied and the effects of alternative uses evaluated.

4. Projections of future agricultural land uses. With a large amount of dryland, rangeland, and wildlands in the county, a major question was: How much land is suitable for expansion of irrigated agriculture? Three alternative water supplies were described (see graph). All suitable undeveloped land in the county was "computer-mapped" by the planning consultant, using criteria established by farm advisors.

5. Crop water requirements. Using known crop acreages and estimates of applied irrigation water, a general estimate of crop water use was made. Evapotranspiration requirements for each crop in each basin were studied.

6. Ability of agriculture to pay for water. The method used to evaluate this factor measured payment capacity—the residual between income and costs. This provides only part of the entire economic picture but serves as an index for planning. Payment capacity figures were based on cost-of-production studies by farm advisors.

7. Penalty costs of salinity in irrigation water. Using new U.C. data on crop-production effects of water salinity levels, studies were carried out to compare the values of waters of different quality by measuring penalty (loss of income) costs.

8. Linear programming of agricultural water demand. Many of the above factors can be plugged into a computer program so that the consequences of a variety of possibilities can be estimated. Using programs and computer time available at U.C., the economic demand for water in each of the eight basins is being estimated.

Results so far

The integrated study of land use and water supply in Santa Barbara County has produced significant findings, including these:

■ Irrigated farmland has increased by an average of 1,700 acres, or 3 percent yearly, for the past 16 years. This is a total increase of 46 percent in that period (see graph).

■ Projections of future irrigated cropland depend on water supply. Only by importing State Project water could the present growth rate be continued. Local water sources, even if utilized to the fullest, would not provide for expansion beyond the 95,000 acres that is likely to be achieved by 1980 (see graph).

■ Water payment capacities for each crop in each of the water basins show a wide range. Crops with relatively high payment capacities include avocados, strawberries, premium table wine grapes, flower seeds, and most ornamental and flower crops.

■ Penalty costs (in the form of reduced yields and income) have been estimated for reclaimed wastewater and for existing ground waters. Reclaimed water would be too saline for use on the high-income crops that are subject to expansion. This fact adds to the potential value of low-salt imported waters.

■ Following analysis of agriculture's economic demand for water in each basin, those areas have been identified in which increased farmland water use can be economically justified.

The land use-water supply study also has helped to clarify certain important policy issues. For example:

■ As a result of computer mapping of suitable agricultural land, the county's planning consultant designated all such land as agricultural, and urged its preservation. Urban growth, at modest rates, was provided for on non-prime land or on skipped-over land within the urban envelope.

■ In evaluating the potential for imported State Project water, there appears to be an advantage for agriculture if the high-quality imported water goes to urban areas. This is because (1) the cities will reduce their pumpage from the underground, leaving more water there for agriculture, and (2) effluents from sewage treatment plants will have much lower salt content, thus making them more usable for a wider range of crops.

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