Economic Analysis and Federal Irrigation Policy: A Reappraisal

Robert A. Young

In framing a government which is to be administered by men over men, the great difficulty lies in this: You must first enable the government to control the governed and in the next place oblige it to control itself.

James Madison
The Federalist, No. 51

The Carter Administration's water policy review team has identified the following problem areas within current federal water policy: 1) Planning and Evaluation Deficiencies, 2) Lack of Emphasis on Water Conservation, 3) Adverse Environmental Impacts, 4) Inequitable Sharing of Costs, and 5) The Large Backlog of Authorized Federal Projects. [White House, Office of Press Secretary.] Students of federal water economics have argued for such reform for at least two decades. [Eckstein; McKean; Hirshleifer, et. al.]. For the last several years, the focus of water policy analysis has been on the formulation and implementation of multiple objective planning procedures as codified in the U.S. Water Resources Council's *Principles and Standards* in 1973. I am among those who are skeptical that the *Principles and Standards* represent an unequivocal improvement in water planning, and believe the time is ripe for an economic reassessment of federal water planning. My objective in this paper is to restate and hopefully to extend the economic analysis in support of the current water policy reform proposals. Due to my own previous experience and limited space, the paper focuses on economic issues related to federal irrigation water planning, as administered through the U.S. Bureau of Reclamation.

It is appropriate to begin this policy analysis with a clarification of my perspective. David Allee keynoted a recent conference with a statement worth repeating. He asserted that the proper role for academic resource economists was to represent those interests which are not otherwise fully represented in the political system (which I interpret to include such groups as the federal taxpayer and non-voting future generations). In what follows, an explicit national accounting stance is adopted, such that costs and benefits will be evaluated from the point of view of the entire nation ("... to whomsoever they may accrue...") as contrasted with regional, state or private sector perspective. It will also be clear that I assign a dominant role to economic efficiency in assessing water resource planning. The analysis also requires the other conventional normative and positive assumptions of applied welfare economics, particularly that preferences of individual members of the political-economic system can be appropriately measured in willingness to pay or monetary terms [Dasgupta and Pearce]. The remainder of the paper is organized as follows. The next section outlines a conceptual perspective. The third section analyzes and critiques federal practice in project appraisal from the theoretical perspective. Pricing, cost-sharing and financing are then evaluated against the criterion of economic efficiency. Following

Robert A. Young is Professor of Economics, Colorado State University. Support of the Colorado State University Agricultural Experiment Station is acknowledged. The views expressed here are my own. I am indebted to S. L. Gray for comments on an earlier draft.

this, the conventional wisdom that there exists an important and inevitable association between public irrigation water investment and regional economic growth is considered, and that hypothesis is examined against the body of empirical evidence. The closing section sums up the argument by asking — Is there "government failure" in resource allocation, and if so, why, and what should be done about it?

Market Failure, Government Failure and Transaction Costs

The development and use of water resources are usually accompanied by one or more of the specific cases of market failure (including externalities, public goods, decreasing marginal costs and uncertainty), which imply a misallocation of resources under market mechanisms. Economic analysis of public water resource management has long emphasized market failure as justification for public intervention into the allocation of water [Krutilla and Eckstein]. Externalities can be positive or negative, pecuniary or technological and derive from either development or allocation. Economies of large scale and decreasing marginal costs are often found in water development schemes, creating problems for financing systems large enough to capture cost economies and presenting difficulties in establishing efficient pricing mechanisms. Recreational uses do not usually consume water at the expense of other users, so in these cases the resource is a public or collective good. Finally, the flowing, mobile nature of the resource and its changing physical characteristics as it passes from vapor to liquid to solid in the hydrologic cycle are causes for high transaction costs in establishing and enforcing property rights in water. In such cases, water may be left as a common property resource, and opportunity costs of utilization may not appropriately confront the user.

Harold Demsetz has shown that most of these market failures can be subsumed under the transactions cost framework, in that each represents an instance in which costs of information, contracting and policing are relatively large and misallocations must be large to justify the establishment of non-market allocation institutions.

Hence, we have in the U.S., a pervasive system of non-market mechanisms for allocation of water, ranging from public ownership of urban water utilities, through state administrative regulations covering the exchange of water rights to national programs for development of water supplies. Just as the private enterprise system for allocating resources is challenged for market failures, it is appropriate to inquire as to the degree to which public management of water supplies succeeds in efficiently allocating resources. The thrust of this paper is an examination of the parallel hypothesis of "government failure" in federal irrigation water resource allocation.

Looking back three-quarters of a century, we can agree that federal actions in irrigation water development stemming from the Reclamation Act of 1902 could be economically efficient, in utilizing potential scale economies and allowing for pecuniary externalities (which we now call regional development or secondary economic impacts). Neither of the above could be fully captured by private sector developers. The program also sought to settle the undeveloped arid west and to increase food production for a growing population. The question for 1978 is whether these justifications still exist.

The government failure hypothesis derives from postulates very similar to those employed in conventional welfare economic theorizing, from which the market failure model is derived. The individual actors — voters, legislators, bureaucrats and interest groups — are viewed as rational, self-interested utility maximizers. The model has been expounded primarily by the "public choice" school, rooted in the writings of Anthony Downs, James Buchanan and Gordon Tullock, and Mancur Olsen (See Gwartney for a summary.) This approach has only recently established a toe-hold among political scientists interested in policy analysis.

Vincent Ostrom presents the only application to water policy with which I am familiar.

Self-interested agency employees (bureaucrats) are motivated to maximize budgets, which are correlated with salary, work-place amenities, and similar perquisites. Certain narrowly-based interest groups may perceive large economic returns from public resource development programs, and provide strong political support to legislators and agencies who promote these programs. Legislators with an eye toward reelection reward such support with appropriations. Where information is costly, voters find it rational to be uninformed on specific details of policy. Therefore, the political system can fail to allocate resources optimally, in the sense that programs are adopted which fail to maximize utility, because information costs inhibit voters from developing the full information necessary to insure that their preferences are fully exercised.

Theory Vs. Practice in Project Appraisal

Irrigation project appraisal for the National Economic Development Account (economic efficiency) purports to employ conventional benefit-cost analysis. A project is deemed economically feasible if the discounted stream of benefits exceeds the discounted stream of costs *and* the public project is the least expensive method of providing the output of goods and services [Herfindahl and Kneese]. In this section, I compare the theoretical ideal with agency practice for each of these elements.

Measuring Benefits

Benefits are defined in terms of willingness to pay for project outputs [Young and Gray 1972]. For an intermediate good such as irrigation water, market values are rarely available for a specific project area, so the accepted procedure is to define benefits in terms of *change in net income, with as compared to without the project.* [U.S. Water Resources Council; Stewart; and Young and Gray, 1972].

The discussion can be facilitated by expressing the concept in symbols:

Let

$$1) \qquad Z = \sum_{i=1}^{m} Y_i P_{y_i} - \sum_{j=1}^{n} X_j P_{x_j}$$

where Z = Net income (for project area); Y = Irrigated crop outputs (i=1,2 . . . m); and X = Inputs to production (excluding irrigation water) (j=1,2 . . . n). Time subscripts are omitted to simplify notation.

Then the change in net income (ΔZ) can be written as follows, introducing subscripts (0,1) to represent the yield and input quantities in the *without* (0) and *with* (1) cases, respectively.

$$2) \qquad \Delta Z = Z_1 - Z_0 = \left(\sum_{i=1}^{m} Y_{1i}P_{y_i} - \sum_{j=1}^{n} X_{1j}P_{x_j}\right) - \left(\sum_{i=1}^{n} Y_{0i}P_{y_i} - \sum_{j=1}^{n} X_{0j}P_{x_j}\right)$$

(Input and commodity prices are conventionally assumed to be unaffected by a given project output.) Two objections to specific procedures employed by USBR are expressed here. One has to do with the assumed zero social opportunity costs of family labor and management, and the second with general equilibrium effects of assumed improvements in crop production technology.

The first issue, the social opportunity cost of family labor, was analyzed by Freeman in 1966. He showed that the USBR procedure of omitting a charge for family labor under the more intensive post-project farming conditions, in effect, assigned a zero social opportunity cost to such labor. Appropriate corrections were found to have a major impact on estimated net benefits. No change in this analytic procedure has been made in the ensuing dozen years, however, and project benefit estimates are accordingly overstated. Freeman's analysis did not consider the opportunity cost of management, a factor also ignored by USBR procedures. Many farm

management analysts attribute a charge of 10 to 15 percent of gross sales for coordination and supervisory activities, an amount which if taken into account, has a large impact on ΔZ in Equation 2.

The second issue deals with the general equilibrium impacts of projected crop yield increases. The USBR procedure posits a two percent annual increase in crop yields, projecting trends of the past several decades. Crop yield estimates in the benefit measure are derived as of the half-way point in the project life. For a project with an assumed ten-year planning and construction period and a 50-year life, the yield estimate is as of 35 years into the future (10 + 50/2). This permits a crop yield projection for benefit estimate purposes of 70 percent over yields being experienced at the date the calculations were made. However, inadequate adjustments are made for added inputs to achieve yield increases. More significantly, no compensating adjustments in commodity prices are allowed. This is, in effect, a partial equilibrium approach to a general equilibrium problem. Technological improvements will affect all the nation's crop production, not just that which occurs on reclamation projects. Increases of such magnitudes are likely to have adverse effects on prices. The history of agricultural prices in the U.S. has shown that the producer captures little if any of technological advances. Given the inelasticity of demand with respect to price, the real price of food has fallen as per acre yields have increased.

This is not to claim the question of the proper price has an easy solution. A number of analysts have advocated using current crop yields and prices implicitly assuming that the forces of population, income and export growth, and yield increase will remain in the same relationship as presently exists [Martin and Young]. This is a rather conservative assumption, and probably underestimates the negative effect of increased output on real prices. Keleta shows that the USBR procedure has an enormous impact on benefit measures, increasing the estimated benefit by a factor of *two to four* as compared to the alternative assumption of current yields and prices.

It is my belief that if these two points were properly accounted for in USBR benefit estimate procedures, there would have been only a very few, if any, projects initiated in the past two decades which could have met the B-C criterion.

Measuring Social Costs of Irrigation Projects

Estimating social costs in benefit-cost analysis is generally thought to be the least difficult issue, and recent analysts have given the agencies passing marks in estimating actual budget outlays. However, budget costs are not the same as social costs, and several examples may be identified where agency practices tend to ignore the distinction.

The first instance involves the social cost of farmland for a reservoir. The USBR tends to use current market prices as a measure of social cost. In the Narrows project proposed for the lower South Platte in Colorado, the reservoir site will inundate a valley which already contains a small but thriving community and a considerable amount of irrigated land. The land acquisition in the project planning reports is costed at the purchase price on the current market. Bidders in that land market, because of risk and other factors, probably have a higher discount rate than does the public (see below) and most certainly estimate the stream of benefits less optimistically than does the government procedure described above. As Eckstein pointed out two decades ago, the proper procedures would be to calculate the social opportunity cost of such land in terms of foregone benefits, and the foregone benefits should, in this case, be estimated in exactly the same way as are the direct benefits. Such an approach, in the Narrows case, would have increased land acquisition costs by some 300 percent.

Another example is the foregone nonmarket benefits where the construction site is on public land and is used for recreation. (These are the "Environmental Costs" noted

by the water policy review.) While we are on much less firm ground in assigning measures of environmental benefits foregone, the effect of placing estimates in the social cost column should be a step in the right direction. It is not clear that the new Environmental Quality account procedures are all that helpful in resolving these issues. In fact, EIS statements are a step backward in economics, largely obscuring the detail of the economic analysis.

My final example of unstated social costs is external diseconomies. The classic instance is the Welton-Mohawk project in western Arizona, where seepage from upslope lands caused waterlogging and salinization on lower-lying project lands. The drainage system installed to mitigate that externality passed the salinity back to the Colorado River and hence to Mexico, precipitating the great Colorado River Salinity controversy [Oyarzabal and Young]. There is indication that at least the first of the twin diseconomies was anticipated, but was not costed, since the project would thereby have been infeasible.

The Social Rate of Discount

The discount rate has an obvious impact on water projects, which are characterized by large front-end costs and a long life over which net benefits are discounted. A decade ago, the Water Resources Council took steps to bring the rate of discount on public water projects more closely in line with social cost of capital. Currently, a rate of 6 5/8 percent is authorized. (That rate is, I think, about right, but for the wrong reasons. But that's another story.) The Congress, however, has permitted a grandfather clause such that projects authorized earlier than 1968 may be evaluated at the rate in effect at their initial evaluation. While the bias from using 3.25 percent rather than 6.625 percent will vary from project to project, the impact is clearly non-trivial.

Identifying Lesser-Cost Alternatives

The two major conditions for economic feasibility, it will be recalled, are 1) a positive discounted net benefit stream and 2) an assurance that the proposed public investment is the least expensive means of achieving the same outputs. For this second condition, both the private sector and state or local government jurisdictions can be the source of a lesser-cost alternative.

My observations of a number of federal water projects suggest that attempts to identify lesser-cost alternatives involving other than federal construction are seldom pursued with any reasonable vigor and are never successful. Of course, the least cost alternative may mean no public action at all, a course of action that gets insufficient attention.

Examples on this issue come mainly from situations where reliance on private ground water development, perhaps as a new source of water or perhaps a continuation of existing developments, provides a viable alternative solution to a public investment. Ground water management involves many unknowns, such as the exact nature of many complex interdependencies and the true quantity and/or quality of the resource. Hence, reliance on such sources may be fraught with legal and political complexities and high risks of getting into long-lasting adversary court actions. In economic terms, high transaction costs may characterize these alternatives. Thus, apparently, simple engineering solutions are sought by local interests for solutions to problems. The federal planning capability, of course, largely concentrates on design and appraisal of structural measures. Federal benefit-cost analysis is organized to determine if a specific project is feasible, and only recently have attempts been made to answer the larger questions of what is the best long-term policy. I am, in reality, less critical of agency practice on this point than on the earlier ones mentioned. The economics profession has only in recent years begun to focus on rigorous analysis of alternative institutions, and if there were a sincere effort to examine such alternatives, it is not clear how much help we have yet to offer.

Pricing, Cost-Sharing and Finance

The arrangements whereby irrigation water is priced and financed have considerable interest to economists, both for their distributive and allocative impacts. Economic efficiency requires that price be set at long-run marginal cost, while equity calls for beneficiaries to pay in proportion to services received.

Pricing and Beneficiary Cost-Sharing

The provisions surrounding finance of reclamation projects have had a stormy history. Numerous changes have been made by the Congress, all in the direction of further separating beneficiaries from incurring the full cost of the facilities. In the flush of early optimism, the Reclamation Act of 1902 provided that settlers were to receive land without cost and repay the facilities cost without interest on the money in a period of ten years [Huffman]. When it was found that new settlers inexperienced with irrigation might not be generating surplus income for several years, the repayment period was soon extended to 20 years and finally to 40 years, still interest free. Amendments to the Reclamation Law passed in 1939 in effect separated repayment requirements from the actual cost of delivering the water. Charges to water users were converted from a cost basis to an "ability to pay" principle, based on a concept of "repayment capacity." The repayment obligation remains free of interest charges. Current projects are subsidized to over 80 percent of costs, if the interest on a normal repayment period is factored in. That is, irrigation water recipients are obligated to pay less than 20 percent of the cost of structures, storages and conveyance systems [North and Neely].

It is instructive to examine the ability to pay formula in detail. The formula turns out to be almost exactly identical to Equation 2, shown above in connection with the discussion of benefit measurement. The same budget data assembled for the project area are employed. Two crucial changes are made, however. First, crop yields for the repayment capacity analysis are current rather than 1.7 times the current level, as in the benefit measure. Second, a family living allowance is deducted. (The allowance changes over time to reflect the cost of living.) The final details of the repayment contract for water is a matter of negotiation between USBR regional officials and representatives of the conservancy district or water users association which will eventually receive and distribute the project water. The federal representatives are authorized to set the contract at a rate up to 25 percent below the calculated repayment capacity, as an allowance for risk. That discretionary power is usually exercised, so the effective cost to the water users is typically 75 percent of the estimated repayment capacity.

Several economically significant inferences can now be drawn. First, while the family living allowance is not a precise measure of the social opportunity cost of family labor and management, which properly would be deducted from revenues in the change in net income calculations, it is not too inaccurate an estimate, and certainly much better than the one used. Therefore, if one accepts that current yields and current prices represent an appropriate basis for computing change in net income, the repayment capacity is a reasonably accurate measure of the value productivity (benefits) of water. Second, the actual cost-share or price contracted for by water user groups will be enough below the value productivity of water, that even the most risk-averse of farmers will be willing to enter into the repayment contract. Third, note that no matter what the social cost of the project might be, such costs have no bearing on the "cost-sharing" arrangement negotiated between the government and the water users. The water users always are presented with terms they can afford unless the repayment capacity is greatly overstated. Given that the beneficiaries pay but a fraction of costs, even if benefits are greatly overstated, the ratio of local benefits to local costs is quite likely to be greater than 1.0. Local

demand for projects is not surprising under the circumstances. Finally, very little of the subsidy (the difference between actual cost and the charges levied on the user) actually accrues to the farmers themselves. In reality the majority of the investment is dissipated to the bureaucratic planning process and the construction industry. A large public expense is made per dollar of net water user benefits.

Financing

By the late 1930s, it became clear that beneficiary groups would be unable to repay the full amount of irrigation project investments, even within the long interest-free period. Congress, undaunted by that quasi-market test of program viability, adopted the "ability to pay principle" just described, and authorized the difference to be paid from hydroelectric power revenues. Electricity sales turned out to be the real jackpot of the reclamation program, even more so with the recent energy shortages.

The interpretation, promulgated by the USBR, that water users repay project costs may be technically true, in that users, as a whole, are obligated to repay those costs Congress has specified to be "reimbursable." That portion of irrigation projects not repaid by farmers are financed by "Basin Accounts," which permit deficits from one project to be made up from surpluses from others. This preserves the illusion that beneficiaries repay costs and that the federal Treasury, in the long run, comes out even. However, the power beneficiary pays most (80 + %) of the irrigation water costs.

Therefore, the assertion that users do pay warrants the most serious challenge. The overall financing system can be viewed as a vesting of property rights for the remaining undeveloped waters in the west (and for the associated electricity) in the Bureau of Reclamation (directly) and indirectly in the small group of potential water users who may eventually benefit by having their water supply financed by surplus power revenues. No provision has yet been made for power revenues to go to other than water projects. Therefore, the only regional use is for more water projects and the power revenues fund is, in effect, a common property resource to be captured by the state or locality with the most effective and powerful Congressional support. On the principle that the net investment return ought to go to the risk-bearer, which is the public via the federal Treasury rather than the USBR or potential beneficiaries, the surplus power revenues should be returned to the general treasury, or at least made available to the states without requiring that such monies be spent for water projects. In view of the prospective enormous sums becoming available due to energy price increases, this matter deserves immediate resolution.

We turn now to the question of regional economic development and the evidence on the role of public water investment.

Irrigation Development and Regional Economic Growth: Myth and Reality

The early supporters of federal participation in reclamation listed prominently among their objectives "to develop and utilize resources then unused." [Hibbard, pp. 439-42]. This has carried through to the present day. In *Principles and Standards* [U.S. Water Resources Council] regional development as an objective occupies a prominent role in the evaluation procedures.

> Through its effects — both beneficial and adverse — on a region's employment, population, economic base, environment, social development, and other factors, a plan may exert a significant influence on the course and direction of regional development (pp. 24816).

Benefit-cost analysts are advised by theorists to omit secondary impacts from studies taking a national accounting stance [McKean], since the impacts are expected to be offset elsewhere except in special circumstances. However, reading their pronouncements on western water policy, one would infer that there is little doubt in the minds of most influential western political leaders and

members of the press that there is a large and inevitable linkage between irrigation water development and regional growth. It is this mythology which provides the justification for the intense political pressures in support of irrigation development. This section surveys the evidence for such a belief.

The *a priori* analysis of the issues would question this optimism. New water goes largely to marginal crops: feed grains and forages. For such crops, employment and net income per acre foot of water are relatively low. Further, the multipliers which represent the impact of producing such crops on the related sectors tend also to be low, so regional impacts are not likely to be large. [Kelso, et. al.]. If factor supplies are at all elastic, which, in the long run, we would expect to be the case, large economic rents would accrue only during the initial stages of a project. The exception would be land, which tends to be inelastic in supply.

I have been able to identify only a few *ex post* statistical analyses of the impacts of public water investment on regional economic growth. Howe and Cox, et. al., from statistical studies concentrating on the east and south, agreed in inferring that "water resource developments are likely to be poor tools for accelerating regional economic growth." (See Fullerton, et. al., p. 2, for a methodological critique of their techniques.) Rivkin-Carson, Inc., Washington, D.C.-based economic consultants, performed two analyses of the issue of water and regional growth. The first [Carson, et. al.] attempted to extend the previous research by sampling geographic sub-regions from all parts of the country, both rural and urbanized, and attempted to analyze the effect of a more extensive range of water programs than just water transportation and dam construction. The authors did not find statistically significant relationships between water resource instruments and population growth in the sample of counties tested.

The second Rivkin-Carson analysis (1973), performed under contract with the Bureau of Reclamation , was innovative in several respects. The theoretical and econometric tools were more sophisticated and data were organized in a unique fashion. The basic data unit was an "economic sub-region" as contrasted with the more usual political subdivisions. Economic sub-regions were defined by new techniques of computer mapping. The main analysis of interest here is found in Chapter 5 of the report, a more accessible but briefer version of which is found in Cicchetti, et. al. A number of variables representing Bureau of Reclamation investment and various measures of state and local government expenditures were regressed on various indices of growth. Data were for 1950, 1960 and 1970 from five arid western states with operating USBR projects.

Two analyses were performed: a Cobb-Douglas production model and a linear growth equation model. Deflated sub-regional income and deflated value of farm output were the proxy measures of output. In the production model, variables representing Bureau investment in irrigation facilities were not found to have any significant impact on regional income and only a small and not convincingly significant impact (t-value = 1.62) on value of farm output. The growth equations showed sub-regional incomes to be positively related to some USBR investments as well as to state and local government expenditures on education, health, and so on. However, irrigation investment did not enter as a significant variable in any of the growth equations. Coefficients for those Bureau investments which were significant, hydropower, flood control and recreation, were often unstable between periods of analysis and in the case of hydropower, with negative sign. Goodness of fit (R^2) and statistical reliability of coefficients as indicated by t statistics were for the most part relatively good.

In a study which strikingly parallels Rivkin-Carson in timing, geographic scope and method, but apparently without knowledge of that work (and vice versa), Fullerton, et. al. used econometric techniques to estimate the quantitative relations between various types of federal water resource develop-

ment and economic growth in western water project areas and surrounding regions. The empirical analysis employed a variety of techniques, ranging from simple statistical comparison of means, correlation coefficients and multivariate analysis. Data were obtained for 246 counties and 42 water resource sub-areas in Utah, Colorado, New Mexico, Nevada, Montana, Wyoming and Idaho. Up to 12 indicators of regional economic growth, including population and three measures of income were compared for areas with and without water investments. The analysis is performed with obvious care and rigor, but the results generally identify no relationship between water investment and economic growth. In many of the regression equations, in fact, the irrigation investment variable is negative in sign and in no case is an investment variable found to be significant. The authors sum up:

> The null hypothesis that regional economic growth is caused by investment in water resources of various types is given virtually no support from these empirical results (p. 22).

In anticipation that more refined and detailed data would provide more reliable results, the authors turned to a detailed analyses of the New Mexico experience for which the best data on water investments were available. A simultaneous equation model was specified. These results also indicated that the null hypothesis could not be rejected at the 10 percent level, and coefficient signs (often negative), if significant, would imply that "water investment may be counterproductive in terms of income and employment," (p. 31).

Shanks studied development impacts of five large projects in the Upper Missouri. While he reported a short term growth impact during the construction period, in the long run, few differences between impacted counties and a set of control counties could be measured. Whittlesey, et. al. have also found significant social costs for regional infrastructure and social services imposed by an irrigation project in Washington State.

Conclusion

Summary

1. Federal irrigation project evaluation procedures tend to systematically overstate benefits and systematically understate costs. Potential lesser-cost alternatives to construction programs are not vigorously sought out and examined. The biases are not minor, and taken together, suggest that few if any projects initiated in the past few decades would have been justified with proper evaluation procedures.

2. Cost-sharing and financing procedures violate both economic efficiency and equity criteria. Repayment charges are far below long-run marginal cost. Irrigation water recipients are obligated to repay only the repayment capacity, which as calculated, has no relation to project costs and is free of interest charges.

3. Funds to repay the balance of costs are obtained from hydroelectric power revenues. These basin funds are, in effect, a common pool of water development funds which has zero opportunity cost for states with potential project sites.

4. Since new irrigation projects will provide, at the margin, new output of low-valued feed grain or forage crops, little regional growth impact would be expected. This prediction is not contradicted by the available statistical evidence.

My conclusion is that the project evaluation procedures, the methods of cost-sharing and the financing mechanisms all point to major misallocation of federal tax monies as characteristic of the federal irrigation program. The hypothesis of government failure in efficient resource allocation is strongly supported. Further, there is little evidence of important alternative social values being gained (for example, in the Social Well-Being, Regional Development or Environmental Accounts) to offset the losses in allocative efficiency.

Finally, it appears that the federal program is, in many respects, a hindrance rather than a help in solving local or regional water prob-

lems. The Reclamation program concentrates on construction projects as a solution, and tends to ignore potential institutional changes which would be more economical. There is an enormous backlog of authorized projects, most of which could not reasonably expect funding for a number of years. However, the lure of a federal solution with 80 percent federal funding improperly encourages local areas to be strung along year after year with small dollops of "planning funds." The inevitable confrontations with the hard problems of water reallocation are postponed, often with a great waste of water and other resources.

Some Suggestions for Policy Change

1. I believe the key link in the system just described is the common pool of surplus power revenues that is permitted by current law and practice to be tapped only for additional water projects. These funds should be separated from the Bureau of Reclamation's financing, preferably by returning them to the federal Treasury. An alternative, more politically feasible approach might be to return these surpluses to the states in which they originate with no strings attached as to the purpose for which they are used. Either of these approaches would establish a range of alternative uses to the present common pool of power revenues and by creating an opportunity cost for irrigation expenditures, substantially reduce the incentive of the states to seek federal water project funds.

2. Concurrent with the above, the "ability to pay" principle for determining beneficiary shares of project costs should be replaced by a procedure which obligates the state or states which expect to benefit for the long run marginal cost (full cost) of project facilities.

3. The Water Policy Review Task Force has suggested the creation of an independent review board to establish more appropriate criteria for project appraisal and to pass on individual project evaluation reports. Clearly, this would provide a most useful corrective to the existing practices.

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