Costs and Benefits of Water Development

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South Dakotans are faced with some important and far-reaching decisions relating to water development. One of the more immediate issues is the formation of one or more irrigation districts in the Oahe Conservancy Subdistrict.

These decisions will rest upon individual assessments of the costs and benefits associated with the development. It is hoped that these will be informed decisions. Lacking full information, decisions are often based on prejudice or misinformation. This fact sheet is intended to give the kinds of information to consider in making wise decisions concerning water development, and some of the reasoning processes involved.

Decisions need not be based exclusively on economic data—that is, on monetary benefits and costs. Only certain factors get into the benefit-cost ratios and the voter or district director may feel that other things are also important. These will be discussed later. The purpose here then, is to discuss all the various considerations necessary in making wise decisions on water resource development.

Public water development projects are usually undertakings beyond the ability of private resources and for that reason they are generally large multiple purpose projects. Benefits in such projects are often diffused, hard to measure, and difficult to assign to individuals. This discussion will start by considering the meaning of economic feasibility, and then the various kinds of benefits and costs.

**ECONOMIC FEASIBILITY OF PUBLIC PROJECTS**

The benefit-cost ratio is the chief measure of economic feasibility used. What does this ratio tell us and what does it leave untold? This can be explained by taking a small watershed project as an example.

Suppose there is one flood control dam planned for this watershed and the benefit-cost ratio is 2 to 1. Then suppose in a re-survey they discover the possibility of another dam and this second dam has a benefit-cost ratio of 1.3 to 1. This dam is added to the project and the total benefit-cost ratio is then 1.7 to 1.

Those who plan projects have to make decisions such as the one in our example: should the second dam be added to the project? By adding the second dam the ratio of benefits to cost is lowered, but the total net benefits are increased. The goal of project planners is not usually a high benefit-cost ratio, but rather high net benefits while still maintaining a favorable benefit-cost ratio.

Thus a comparison of benefit-cost ratios from project to project may not be very meaningful. On some federal projects they have aimed at a ratio near 1 to 1 in order to maximize net benefits. The benefit-cost ratio, therefore, tells only what return is expected on every dollar invested in the project as now planned. It tells nothing about net benefits, and also is not a good basis for comparing projects.

In computing the benefit-cost ratio for the Oahe project the costs include construction costs, operation and maintenance costs, a share of Missouri River Basin power investment, and costs of storing water in the Oahe Reservoir. These costs and benefits including interest charged at the rate of 2½% per annum, are then discounted on a 1955 basis and to an annual basis. The benefit cost ratio for this project is 1.46 to 1.

**REIMBURSABLE AND NON-REIMBURSABLE COSTS**

Over the years Congress has established rules for handling the costs of various kinds of projects, such as flood control, irrigation, power, recreation, and navigation. For instance, the costs of developing a power project are generally considered completely reimbursable to the federal government.

In other words the users of power must repay, through power charges, the complete cost of the installation, including interest. The beneficiaries of power are easily identifiable as the power users.
Irrigation water users can be identified easily also, but Congress has a slightly different rule for irrigation projects. The users must pay back a share of the costs of the project development, not including interest, for all works to the farm outlet. Navigation, on the other hand, is a non-reimbursable cost in the eyes of Congress. Waterways developed by the federal government are used without charge. Flood control and recreation are generally non-reimbursable costs, but there are exceptions. The Oahe Unit recreation construction costs, for example, are to be repaid from the Missouri River Basin power revenues. Some small flood control projects require some local participation in the form of providing easements and other minor costs. Reimbursable costs of the Oahe project are expected to be repaid 14% by the irrigators, 1% by the conservancy subdistricts, 2% by the municipal and industrial users, and 83% by power users.

COSTS

One of South Dakota's principal costs of water resource development from the Oahe reservoir is the value of the land removed from production and tax rolls for use as canals and reservoirs—an estimated 32,000 acres within and 31,000 acres outside the project boundaries.

The land already given up for the main stem reservoirs is an inevitable cost to the state, whether or not the Oahe irrigation project is developed. The land for canals and reservoirs for the irrigation project will be an additional cost incurred only if the project is built.

DIRECT AND INDIRECT BENEFITS

In computing benefits, it has been customary to divide them into two categories—direct and indirect. The direct benefits from irrigation, for instance, are the net increases in value of production resulting from application of irrigation water. These direct benefits are much easier to compute for a project reclaiming desert land than for a project converting dryland farm units into irrigation units.

In computing direct benefits the question is raised, is the net increase computed from an average dryland farmer to a superior or inferior irrigation farmer? In studies made by one of the authors he assumed a superior dryland operation and a superior irrigation operation in order to be consistent. Unfortunately, we will probably find that not all dryland farmers will convert readily into good irrigation farmers.

Indirect benefits are second-order benefits, so to speak. They are the increased profits in the community due to increased farm production and farm spending—increased sales to farmers and increased processing of farm commodities.

Within a community or region indirect benefits are net gains to the local economy, but in periods of full employment one region's gain may be another region's loss. South Dakota as a region is certainly justified in including indirect benefits in its comparison of total costs and benefits from water development projects.

There are also tangible and intangible benefits. Both direct and indirect benefits are considered tangible. You can put your fingers on them and compute them at least roughly. Intangible benefits are those which cannot be computed because they are so general and widely diffused. For instance, the increase in stability of production and the effect this has on the community is an intangible yet very real benefit. To put a dollar value on it is well nigh impossible. Intangible benefits are almost uniformly left out of computations of economic feasibility.

THE POTENTIAL IRRIGATOR’S POINT OF VIEW

The farmers owning irrigable land are going to make the crucial decision as to whether the Oahe project is to go forward or not. They may consider primarily their own short run prospects for monetary gain or loss. As will be pointed out later, however, this should not be their only consideration.

At present the only research answering the farmers' questions concerning the relative profitability of irrigation and dryland farming is reported in South Dakota Agricultural Experiment Station Bulletin 414, and some studies of the Bureau of Reclamation. The study resulting in Bulletin 444 was conducted from 1952 to 1955.*

Before going into relative profitability, we should mention the types of irrigation charges a farmer must pay. Part of the charges will be assessed as construction costs, part as operation and maintenance charges, and part will be paid directly by the farmer for developing and irrigating his land. Construction charges are to be collected by the district and paid to the Bureau of Reclamation. These charges are for the work the Bureau of Reclamation has done in building the water works for conducting water to the farm boundaries and for both surface drainage

*See also these publications of the University of Nebraska, Agricultural Experiment Station: Bulletin 434, "Adjusting to Irrigation in the Loup River Area in Nebraska" (1956), and Bulletin 421, "Effect of Pump Irrigation on Farms in Central Nebraska" (1953).
works and tile subsurface drainage of irrigated land both on and off the farms. These charges will vary with the class of land, but will average $4.25 per acre for irrigated land in the Missouri Slope area and $3.55 per acre in the Lake Plain area. However, these charges will not be assessed until 10 years after water is delivered to the project land, and will then continue for 40 years.

Operation and maintenance charges, estimated at $6.38 per acre of irrigated land, are collected each year after irrigation water is delivered. These charges, known as O & M, are made in order to pay the day-to-day costs of running the project, and are graduated from $2.00 per acre upward during the development period.

What are some of the benefits farmers are likely to realize from irrigation? One of the findings from the 1952-1955 research as reported in Bulletin 444 still appears valid; that the greatest benefit from irrigation will be its stabilization effect; that is, irrigation reduces the year to year changes in production and income arising from varying rainfall.

The report referred to indicated that fluctuations in income and production may be reduced by 70 percent by using irrigation. The report went on to present a comparison of incomes, investment and labor requirements for an 800-acre cattle-hog dryland farm and a 682-acre partially irrigated cattle-hog farm.

Net labor and management income was $6995 on the dryland farm, $8205 on the irrigated farm. Total investment was $42,013 on the dryland farm, $66,421 on the irrigated farm. Total labor requirements were 244 man-days on the dryland farm, and 464 on the irrigated farm. Many other comparisons are made in the report. More recent studies by the Bureau of Reclamation may be found in Appendix E of the Report on Oahe Unit, pages E-333 and E-334.

Frequently, it is pointed out that irrigation farming requires more labor than dryland farming. In the report mentioned previously (Bulletin 444) it was estimated that on farms of the same acreage, irrigation farming would require twice the man labor that dryland farming required. However, this ratio is only a guide, for labor requirements will vary with the amount and type of livestock and crops, with the proportion of irrigated land on a given farm, and with the manner in which the farm is developed for irrigation.
Listed below are some of the problems that will arise in changing from dryland farming to irrigated farming.

1. How to make the change from dryland to irrigation farming
2. The techniques of irrigation
3. The financing of land development costs
4. Obtaining the additional labor and equipment required
5. Developing increased managerial skills
6. Determining suitable types of farm organization

Many of these problems can be lessened by an intensive Extension educational program in the irrigated areas.

WATER DEVELOPMENT AND REGIONAL ECONOMIC GROWTH

It is not necessary to review here the economic trends in South Dakota associated with a declining rural population, controlled agricultural production, and retirement of crop acres. The progress in agricultural efficiency has worked against South Dakota, in spite of the fact that agriculture is our main industry.

Agriculture faces an inelastic demand for its products. This means that increased production resulting from technological advances decreases farm income rather than increases it. Programs to cut production may help bolster national agricultural income, but they also may work against a particular region where the largest production adjustment takes place.

South Dakota has had a relatively declining economy. Its income has fluctuated widely with agricultural production and prices. Population losses have been great—the equivalent of a city the size of Brookings or Pierre has been lost every year for the past 10 years. You may wonder how this can be with a 3 to 4 percent increase in population for the decade. Our slight increase was actually only a portion of the natural increase. Had there been no loss of population during the past decade, we would today have approximately 93,000 more people in the state.

It is hard for an economy to counteract the effects of a declining population. If labor and capital are not earning as much here as they can elsewhere, then it is understandable why they leave. With certain assumptions it can also be stated that this departure of inefficiently used resources also aids those who remain, in that the farm income is then divided among fewer people. But this overlooks the cost of change—the cost of school and governmental reorganization, business losses, and utility disconnects and inefficiencies. Water development offers perhaps the best hope South Dakota has of reversing this trend of population loss and economic decline.

FACTORS IN DETERMINING HOW TO VOTE

The individual voter must weigh both sides and make his decision to vote for or against an irrigation district or other water development proposals. These are the things he should consider:

1. What will be my immediate personal costs and direct benefits?
   - Costs will include water charges, property taxes.
   - Direct benefits will be the increased income from increased crop yields and increased livestock production.

2. What other benefits and costs will there be?
   Benefits will include:
   - Increased stability of income
   - Diversification of the economy
   - Increased off-farm opportunities for young people and others leaving the farm and for part-time farmers
   - An increased tax base for support of community services
   - Improved community services
   - Beautification of town and countryside by the availability of sufficient water for lawns, trees, and shrubs

Other costs or disadvantages include:
- Necessity for learning new farming techniques
- Necessity (for some) of disposing of some land
- Maintenance costs to counties associated with canal crossings, new bridges, and some new roads
- Farm and community divisions where main canals cross and result in limited access to area on other side of canal
- Loss of choice to decide between dryland or irrigation farming in the project area (though by reversal it may also be said that these farmers cannot choose to irrigate until this project is completed)

The requirement that water charges be paid on irrigable land whether the water is used or not will likely be viewed as a cost or disadvantage by some.

In North Dakota some blocks of irrigable land were left out of the project according to the wishes of the land owners, thus alleviating this problem.

The main plea of this section is that the voter look beyond his own short-run benefit-cost ratio and consider some of the longer run effects of irrigation development on his farm business, his community, and the economy of the state.