

IRRIGATION IN MONTANA – A PROGRAM OVERVIEW AND ECONOMIC ANALYSIS

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ECONorthwest specializes in the economic and financial analysis of public policy. ECONorthwest has analyzed the economics of resource-management, land-use development, and growth-management issues for municipalities, state and federal agencies, and private clients for more than 30 years.

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EXECUTIVE SUMMARY

This report describes the relationship between irrigated agriculture and Montana's economy, and examines how this relationship might be affected through potential state investments in existing and new irrigation projects. It was prepared for the Montana Department of Natural Resources and Conservation (DNRC) by ECONorthwest, an economic consulting firm, with the assistance of staff from another firm, PBS&J. To complete the report, we reviewed relevant data and past studies, interviewed persons knowledgeable about irrigation from throughout the state, and prepared ten technical memoranda for interim review by staff from DNRC and the state Department of Agriculture.

Irrigation is the dominant commercial use of the state's water resources, accounting for 96 percent of all surface and ground water withdrawn for any purpose, about 11 million acre feet (an acre-foot of water is the amount that would cover an acre one foot deep). Irrigated agriculture also is an important component of the state's economy. It directly produces economic benefits by increasing the supply and/or value of some crops, and it generates jobs and income for many Montanans. Data are not available to isolate irrigated agriculture, *per se*, but the overall agricultural sector in 2006 produced crops worth \$1.1 billion, livestock and related products worth \$1.3 billion, and net farm income of \$250 million. It also employed about 31,000 people (full- and part-time). About 18 percent of all harvested cropland in the state is irrigated, but irrigated crops represent a higher percentage of the overall agricultural sector, as irrigation increases the crop yield per acre and allows some lands to produce higher-value crops. About 72 percent of all irrigation water is used to produce hay and pastureland, which are inputs to the production of livestock and related products.

Irrigation also has important indirect economic effects. These materialize as irrigation increases the ecosystem's ability to produce some non-crop goods and services, and decreases its ability to produce others. These effects, which economists call externalities, impact jobs and income throughout Montana. For example, some irrigation systems increase the supply of recreational opportunities on reservoirs and generate jobs in related economic sectors. At the same time, they eliminate recreational opportunities and affiliated jobs by dewatering streams and reducing instream water quality.

The externalities of irrigation are economically important throughout the state, although their importance varies from place to place. In many locations, they are more important than the direct increase in crop values resulting from irrigation. Evidence for this conclusion comes from several sources. In many places, the value of irrigated land is determined more by the land's ability to provide attractive scenery and other amenities than by its ability to increase net farm earnings. Several analyses have determined that society's willingness to pay to leave water in some streams and rivers exceeds farmers' willingness to pay to use the water for irrigation. All else equal, counties in the Upper Great Plains

with greater water-related recreational opportunities, often at irrigation-related reservoirs, typically have higher household incomes than those with lesser opportunities. Throughout Montana and other western states, counties with stronger natural-resource amenities, such as water-related recreational opportunities, have higher rates of growth in jobs, higher levels of household income, and higher concentrations of entrepreneurs.

There is a widespread belief—the data currently available, however, are too limited to fill-in the details—that many of the state’s irrigation systems are in disrepair. Moreover, it appears that, in certain locations, serious, if not insurmountable, hurdles are likely to keep the irrigators who historically have borne responsibility for maintaining irrigation systems from mustering sufficient funds to keep the systems from deteriorating further and, perhaps, falling out of service. Many systems lack the institutional foundation needed to plan refurbishment, raise sufficient funds, and complete the job. In some locations, residential farms and ranches—called hobby farms or ranchettes—have replaced commercial agriculture, reducing the number of commercial operations that historically have had financial responsibility for irrigation infrastructure and, more fundamentally, raising questions about who bears what responsibility for the system. In surveys, irrigators commonly assert that they lack sufficient financial resources to undertake significant investments on their own. It is not clear that investment of state funds, alone, would be adequate to overcome these and other factors contributing to the decline of some irrigation systems. Circumstances vary widely from system to system, indicating that further investigation of this question likely should occur on a case-by-case basis.

To ascertain the overall economic consequences of potential state investment in irrigation infrastructure, future analyses should consider more than just the direct effects on the production of irrigated crops. The externalities of irrigation, both positive (e.g., contribution to an agrarian quality of life) and negative (e.g., water quality problems and diminished in-stream recreational opportunities), are sufficiently important that one cannot fully understand the potential economic consequences of investing in an irrigation system unless the impacts on them are accounted for. In addition, future analysis should consider factors that are likely to exert considerable influence over the irrigation-economy relationship in the future. Foremost among these are the future evolution of agricultural markets, the effects of anticipated changes in climate, amenity-driven growth and its impacts on the price of irrigated lands, and the resolution (or not) of intrastate and interstate disputes over water.

We examined three aspects of the economic consequences of investments in irrigation: (1) the *net economic benefits*, i.e., the net value of the goods and services available to consumers; (2) the economic *net impacts*, i.e., the net changes in jobs, incomes, and related variables; and (3) the changes in economically important *uncertainties and risks* regarding values and impacts. Based on our findings, we offer the following recommendations for those seeking to enhance the net economic benefits and net economic impacts derived from irrigation.

A. Before investing public funds in irrigation, Montanans should consider the full suite of positive and negative consequences, as well as the major trends likely to affect the future relationship between irrigation and the economy.

To determine the overall net benefits and the net impacts of an irrigation investment, one must consider how it would affect the supply of goods and services associated with all the competing demands for water-related goods and services. These include the demand for irrigation water, of course, but also competing commercial demands from other irrigators and/or other sectors of the economy. They also include consumers' demands, which we separate into two categories. One is consumers' demands for amenities that affect the quality of life for residents and visitors to the state. The other is their demands for environmental values associated with the ecosystem's ability to lower the cost of living and to sustain valuable species, resources, and landscapes.

Public funds should not be used to modernize or expand irrigation if private parties would undertake such actions without public funding. Spending public funds in such instances would not increase net economic benefits or impacts above what otherwise would occur. Public funds should be invested in irrigation only when doing so would generate net economic benefits from projects that otherwise would not occur. Stated differently: a public investment should be undertaken only in circumstances where (a) private parties have determined that the investment would yield net costs (would not yield net benefits) for private investors; and (b) the externalities from the investment are expected to yield net benefits sufficiently large to outweigh these net costs. This decision-making approach will guard against making investments in irrigation projects that irrigators, themselves, are willing to make, and ensure that public funds generate the highest net benefit for Montanans as a whole.

Similar reasoning applies to the extent that Montanans care about the impact of an investment in irrigation on jobs and related variables rather than on its net benefits. Public funds should be invested in irrigation to generate jobs only when doing so would have a greater net impact than allocating the funds to alternative uses.

B. Montanans should consider the distribution of positive and negative economic consequences among different groups.

Any investment in irrigation will yield both positive and negative economic consequences, and their distribution among different groups must be determined on a case-by-case basis. As a general rule, however, the direct distributional outcome will be that taxpayers will incur the monetary cost of the investment and the irrigators—as well as the consumers of irrigated crops and the land owners, workers, businesses, and communities linked to the resulting increase in irrigation water—will realize the economic benefits and/or increases in jobs, income, and property value. The externalities of the investment—positive and negative—are harder to predict. Changes in recreational opportunities and other

amenities likely will affect both local residents and businesses as well as those farther away, in correspondence with the households' willingness to travel to take advantage of them. Changes in the ecosystem's ability to produce goods and services, such as flood control, also may have both local and distant consequences.

C. Montanans should consider investments in improving irrigation efficiency as a reasonable complement or alternative to refurbishing existing irrigation infrastructure or constructing new infrastructure.

Although some are far better than others, Montana's irrigation systems, as a whole, are among the least efficient in the West, withdrawing much more water from streams and aquifers than irrigated crops require. Improving the efficiency of inefficient systems may leave current irrigators with adequate water for their crops and increase the supply of water for additional irrigation or for the production of non-crop goods and services. There are three general efficiency-enhancement strategies: (1) convert less-efficient, surface-irrigation methods to more-efficient methods; (2) use irrigation-scheduling techniques that measure crops' irrigation requirements precisely; and (3) reduce losses of water by lining ditches and canals that deliver irrigation water. Such actions probably would have multiple economic consequences, some positive and some negative, which must be determined on a case-by-case basis.

Public investment in water-use efficiency may be warranted insofar as irrigators expressing a desire to invest in water-use efficiency often say they lack the financial means to make the investments. Public investment also may be influenced by current water law, which can discourage private investments in water-use efficiency, because the current water user may realize few of the benefits when such investments make water available for other uses and users.

D. Montanans should investigate and pursue opportunities to develop markets that offer opportunities to increase farm income derived from irrigation water.

Two types of markets offer opportunities for additional farm income. One creates or expands opportunities for irrigators to receive Payments for Ecosystem Services (PES) they produce. The other facilitates the transfer of water from a lower-value use to a higher-value use.

Some PES markets, such as the Conservation Reserve Program, are familiar and long-standing. Over the past couple of decades, however, programs with greater diversity have emerged, enabling some farmers to receive payments for restoring wetlands (the Montana Enhancement Program) and expanding hunting opportunities (Montana Block Management Program). Public investment to broaden the scope of such programs may be warranted to overcome hurdles that impede even further diversification. Efforts might be targeted at reducing administrative costs, creating pilot projects, reducing farmers' risk and liability,

and increasing the funds available to state agencies for making appropriate payments for ecosystem services.

Water markets can offer robust opportunities for increasing the value of the crops (and other goods and services) derived from a given supply of water. Market-based, voluntary transfers of water should increase the economic well-being of both the sellers and the buyers because a transaction would occur only if both parties expected it to be beneficial. Public investment in water markets, at least until more experience with them is accomplished, may be beneficial to overcome administrative, legal, and other barriers that are insurmountable by individual irrigators. Intervention might lower the costs to consider and resolve the concerns of third parties that might be affected by a water transfer, help potential buyers and sellers find one another, and verify that water is moved and used in accordance with the terms of a transaction.

E. Montanans should sponsor research targeted at developing a better understanding of the economic consequences of potential, water-related investments.

We urge giving priority to Montana-specific research aimed at developing a better understanding of the following:

- The non-crop ecosystem goods and services affected by irrigation, their value, and their impacts on jobs and income.
- Opportunities and risks associated with anticipated changes in climate and its potential effects on the demand for crops, the ability of Montana's farmers to grow specific crops, the frequency and severity of drought, the demand for and supply of non-crop ecosystem goods and services, and the economic consequences of decreases or increases in irrigated agriculture.
- Factors other than climate change that might undermine the economic stability of irrigated agriculture in Montana as a whole or in regions of the state. Special concern should address potential conflicts between irrigation and society's demands for non-crop goods and services adversely affected by irrigation.
- The status of existing irrigation systems, the likelihood of a major system disruption or failure, the economic consequences of such an event, and the economic consequences of state intervention to prevent it.
- Opportunities to increase the water-use efficiency of existing irrigation systems, the economic consequences of current inefficiencies, and the potential economic requirements and consequences of efforts to make systems more efficient.
- Opportunities to grow higher-value crops on irrigated cropland, and expand production of value-added agricultural products.

- Potential markets that would expand opportunities for irrigators to increase earnings derived from irrigation water, through payments for ecosystem services and voluntary transactions that transfer water from lower-value to higher-value uses.

We finish our discussion with these final observations. Nothing in this report should be construed as an economic evaluation of any specific, potential investment in irrigation infrastructure. The level of analysis in this report is not sufficiently detailed to provide support for or against any specific public investment in irrigation. Moreover, nothing in this report should be construed as disregarding water rights and the system of laws that support them. Instead, this report describes the relationship between irrigation and the economy and recognizes that, although some elements of this relationship are intertwined with the system of existing water rights, others are not.

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