Technical Memorandum 2.6

Data Limitations and Recommendations for Future Research

June 2008

ECONorthwest
ECONOMICS • FINANCE • PLANNING

99 W. 10th Avenue, Suite 400
Eugene, OR 97401
Phone: 541-687-0051
www.econw.com

CONTACT INFORMATION

This report was prepared by Ernie Niemi and Sarah Reich, of ECONorthwest. ECONorthwest is solely responsible for the content of this report.

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.

For more information, please contact:

Ernie Niemi
ECONorthwest
99 W. Tenth Avenue, Suite 400
Eugene, Oregon 97401
541-687-0051
www.econw.com

I. INTRODUCTION

Throughout this project, we have encountered limitations and gaps in data that have affected our ability to thoroughly analyze the relationship between irrigation and Montana's economy. In this Technical Memorandum, we identify these limitations and data gaps, and discuss the resulting uncertainty in our findings. We also offer our recommendations about research and other steps that could reduce the uncertainty with respect to different types of decisions regarding the future of irrigation in Montana.

II. DATA GAPS

We encountered a number of gaps in the available data, stemming from four underlying factors: limitations in existing data sets, privacy concerns, a lack of basic research, and scientific uncertainty. We discuss each in more detail below.

A. Data Gaps Arising from Limitations in Existing Data Sets

In general, agricultural, economic, and water use data are regularly collected and readily available from state and national government agencies. Issues arising from the methodology and techniques used to collect and report these data, however, limit our ability to fully and accurately describe the past and current characteristics of irrigated agriculture in Montana. The following are examples of some of the issues we encountered:

- Economic and agricultural data sets from the Bureau of Economic Analysis (BEA), U.S. Department of Agriculture (USDA) and the State of Montana provide important information on agriculture and agricultural economics throughout the United States. In most cases, though, these data are not disaggregated by irrigated versus non-irrigated agriculture.[1] The USDA provides the best sources of data reported for various aspects of irrigated agriculture, but even these are incomplete, especially at the county level. The BEA, which provides economic data on different sectors of the economy, does not attempt to distinguish irrigated agriculture from agriculture as a whole in its data sets.

- The U.S. Geological Survey (USGS) and the State of Montana both collect data on water use by various sectors, including agriculture. Much of this data is derived from water rights records, however, which are notoriously inaccurate (usually leading to overestimations), especially for estimating the amount of land to which irrigation water is applied. In addition, the USGS's methodologies for developing water use statistics have changed over the years, which distorts comparisons of irrigation water use and irrigated acres over time.[2] In addition, water-use data for certain types of users, such as tribes, are incomplete.

[1] Personal communication with Christel Pachl, Agricultural Statistician, U.S. Department of Agriculture, National Agricultural Statistics Service, Montana Field Office.

[2] Personal communication with Fred Bailey, U.S. Geological Survey, Montana Water Science Center.

B. Data Gaps Arising from Privacy Concerns

Data availability from the sources listed above, is often hampered by privacy concerns. Privacy concerns also prevent certain kinds of data from being collected at all. The following are some of the issues in this category that we encountered during our research:

- Privacy concerns prevent the USDA and the BEA from reporting many statistics at the county or sub-county levels. Though the data are collected, the agencies may withhold them for several reasons, including to prevent the unintentional disclosure of what might be considered an individual firm's proprietary information, or because the data for a particular area are not robust enough to provide a statistically significant representation of what is going on in a particular area.[3]

- Property values are unavailable in Montana due to privacy concerns. Montana is a non-disclosure state, which in real-estate parlance means that when two parties complete a purchase and sale transaction involving property, they are not required to disclose the sale price. Without this information, it is difficult to determine the current market value of property and how certain features of a particular property, such as access to irrigation, influence the price people are willing to pay. While some private and quasi-public organizations, such as real estate brokers, property appraisal firms, and credit and loan organizations collect data on property values in Montana, we found that they are reticent to share their proprietary data sets to researchers, especially if the data or conclusions drawn from the data will be reported in public documents.[4]

C. Data Gaps Arising from a Lack of Montana-Specific Research

Some types of information related to irrigation and the goods and services affected by irrigation are limited due to a lack of basic research, especially research that is conducted at sites in Montana or on natural resources found in Montana. The following are some examples of the more important gaps we encountered:

- Economic data on the value of non-market goods and services are limited. A few detailed economic studies have been completed related to recreation, especially fishing, in Montana. Less research is available on the economic value of other non-market goods and services in Montana, such as flood control, habitat for threatened and endangered species, and water-based recreation other than fishing.

- Data on the use of water-related goods and services are also lacking. Visitation statistics are collected for many of Montana's most popular attractions, such as national parks and state parks, but much of the water-based recreation in the state is outside these areas, and is not regularly tracked, if it is tracked at all.

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[3] Personal communication with Christel Pachl, Agricultural Statistician, U.S. Department of Agriculture, National Agricultural Statistics Service, Montana Field Office.

[4] Personal conversation with Harlan Lund, Appraiser, Farm Credit Services; Personal conversation with Gary Brester, Professor of Agricultural Economics, Montana State University.

D. Data Gaps Arising from Scientific Uncertainty

Some of the limitations we encountered in the data arose from the fact that certain areas of study are relatively new and rapidly developing. In these areas, many important questions remain unaddressed. Two topics with particular relevance to irrigated agriculture that fall into this category are ecosystem services and climate change. Actual scientific understanding of each is progressing rapidly, but, for now, detailed site-specific understanding remains limited.

III. Uncertainty in our Findings

All of the data gaps identified above insert some uncertainty into our findings, but they do not undermine the general magnitudes, trends, and principles upon which we base our conclusions and recommendations.

- Our descriptions of the land and water resources involved in irrigated agriculture in Montana may be overestimated. In addition, the trends showing the land and water used in irrigated agriculture over time reflect some uncertainty, and the direction and magnitude of any distortion likely varies from year to year, depending on the particular data-collection methods used. Overall, however, we believe our descriptions provide a reasonable representation of the scope and scale of irrigation in Montana.

- Our description of the economic contribution of irrigated agriculture to Montana's economy is obscured by our inability to isolate irrigated agriculture from non-irrigated agriculture. Thus, the statistics we report that include agriculture as a whole undoubtedly over-represent irrigated agriculture's impact. Throughout the project, we clearly note where this occurs, and when possible, we attempt to provide qualitative information to help the reader understand the general magnitude of the overestimation.

- Our description of the economic value of water for irrigation, and the value of non-market goods and services affected by irrigation in Montana relies on studies conducted elsewhere. The degree to which a particular study is applicable to Montana depends on the similarity of the conditions between the study area and Montana. To limit the uncertainty, we discuss the similarities and differences between the two areas, and how the differences might impact the applicability and transferability of the findings.

- Much of the uncertainty in our findings stems from factors beyond our, or anyone else's current knowledge or control. These elements of uncertainty, ranging from future market conditions and fluctuations in commodity prices to how climate change will affect water supplies in a particular basin in Montana, will affect investment decisions made at any given time and place. We stress throughout this project that these elements of uncertainty are important to recognize, understand, and integrate into the decision-making process, as they have direct bearing on the level of risk inherent in any potential investment.

IV. RECOMMENDATIONS FOR FUTURE RESEARCH

Our research has revealed that the analysis of irrigated agriculture and its externalities is confounded by inadequacies in data availability. To facilitate a more complete understanding of the effects of investment in irrigated agriculture in Montana in future analyses, 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.
- 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.
- The expected benefits and costs of alternative strategies for using public funds to strengthen Montana's claim to water before it leaves the state by encouraging development of new irrigation in the Lower Missouri and Lower Yellowstone River Basins.