

Water Quality Concerns Affecting Adoption of Best Management Practices in Colorado

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Introduction

Water quality in Colorado is generally good, although the Colorado Nonpoint Assessment Report indicates that 2087 miles of the major river systems are affected by agricultural nonpoint sources of pollution, representing approximately 60% of the state's nonpoint source pollution problems. These impacts are mainly due to eroded sediment, nutrients and salinity. Other documented water quality concerns include selenium, pesticides, metals, microbial contaminants, and urban runoff.

Research efforts have resulted in many improvements in nutrient management, pest management, and irrigation water management. However, our current knowledge of producer adoption and why...

Objective

One of the objectives of this project was to understand the barriers and opportunities for change and to understand how producers prioritized water quality and quantity concerns.

Methodology

- Survey instruments were mailed, written questionnaires with a total of 48 questions.
- Survey method followed modified procedures described by Dillman (1978) including:
 - Focus groups of cooperating producers to review instrument.
 - Reminder postcards sent three and ten days following the initial mailing of the survey.
- The USDA National Agricultural Statistics Service mailed the survey to a portion of their database.
- Sample was limited to those producers who irrigated any crops, and had at least 16 ha of crop land.
- Mailed to 3,300 addresses across the state in Nov. 2001.
- The survey data were analyzed using PROBIT analysis (SAS, 1990) with logistic regression to identify water quality concerns that significantly influenced producer adoption.



Survey instruments used

Survey Response

- Over 1,300 usable responses were returned for a 40% response.
- The farms sampled by the survey represented approximately 200,000 of Colorado's 1.2 million ha of irrigated land.

Respondent Characteristics

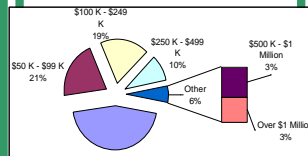


Figure 1. Gross farm sales of respondents.

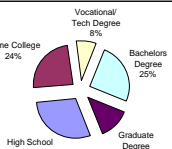


Figure 2. Education level of respondents.

- Experience:** Average years of irrigation experience of Colorado respondents = 30
- Off-farm Employment:** 44% of respondents reported leaving and off-farm job

Adoption of Nutrient BMPs

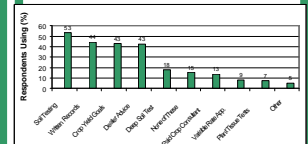


Figure 3. Adoption of nutrient management BMPs by Colorado respondents.

- Colorado producers rely upon soil test analysis more than any other method to determine their fertilizer rate.
- Less than half of respondents reported keeping written nutrient management records.
- Fertilizer dealers and applicators are used more often than paid crop consultants for advice.

Management Changes

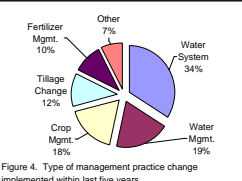


Figure 4. Type of management practice change implemented within last five years.

- 33% of Colorado producers reported no management change in the 5 years preceding the survey.
- Changes in water management or system accounted for over half of the reported changes.

Factors Limiting Decisions

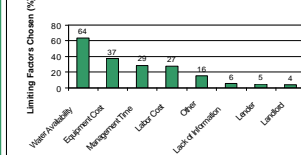


Figure 5. Factors limiting respondents' crop production or irrigation decisions.

- Water, equipment costs, and time were most frequently cited limitations on management decisions.
- The time and labor limitations are consistent with the number of producers having an off-farm job.
- A small minority of producers reported that lack of information limited decision making on their farms.

Information Sources

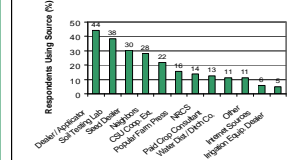


Figure 6. Sources of information used by respondents for crop production decisions.

- Input suppliers (chemical, seed) are the most frequently used information sources for crop production information.
- Results suggest educational programming should be targeted at the primary producer information sources to multiply impacts and outcomes.

Respondents' Water Concerns

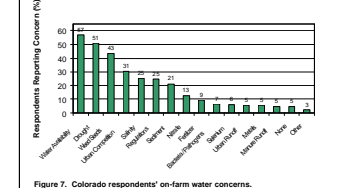


Figure 7. Colorado respondents' on-farm water concerns.

- As expected in a semi-arid state, water quantity dominated irrigating producers' concerns about water.
- After weed seeds, a higher percentage of respondents indicated salinity and sediment as the top water quality concerns on their farm.
- Water quality concerns that are the focus of many outreach programs (nitrate, fertilizers, or bacteria/pathogens) were listed as important by approximately one-third of respondents.

Real vs. Perceived WQ Concerns

Table 1. Comparison of known water quality problems from different regions of Colorado to respondents' concerns.

Region	Known or Potential Water Quality Problems	Respondent Concern for Known Problem (%)	Respondent Highest Water Quality Concern
South Platte	Nitrate	19	Weed seeds (47%)
Eastern Plains	Nitrate	21	Nitrate (21%)
Arkansas Valley	Salinity	58	Salinity (58%)
San Luis Valley	Nitrate	11	Weed seeds (32%)
Mountains	Metals	5	Weed seeds (44%)
Western Slope	Selenium	10	Weed seeds (50%)

- The Arkansas Valley was the only region where an identified water quality problem was widely recognized by the majority of respondents.
- Respondents in the Eastern Plains were concerned about nitrate, a potential water quality problem due to animal feeding and intensive farming in the area, but nitrate is not a widely found in the area's water.

Water Quality Concerns and BMP Adoption

Table 2. Results of PROBIT analyses of water quality concerns against selected BMPs.

Water Quality Concern	Irrigation Water Testing		Soil Testing		Paid Crop Consulting		Keep Nutrient Records	
	Impact on Adoption	Pro-Chance	Impact on Adoption	Pro-Chance	Impact on Adoption	Pro-Chance	Impact on Adoption	Pro-Chance
Salinity	(-)	***	(+)	NS	(+)	NS	(+)	NS
Nitrate	(+)	**	(+)	**	(+)	***	(+)	NS
Regulations	(+)	NS	(+)	**	(+)	**	(+)	**
Metals	(-)	NS	(+)	†	(+)	†	(+)	†
Urban runoff	(+)	NS	(+)	†	(+)	†	(+)	†
Bacteria	(+)	NS	(+)	†	(+)	†	(+)	†
Fertilizer	(+)	NS	(+)	NS	(+)	†	(+)	NS
Urban Runoff	(+)	†	(+)	†	(+)	†	(+)	NS
Other	(+)	†	(+)	†	(+)	†	(+)	†

- Most water quality concerns had limited or no impact on adoption of the BMPs tested.
- Concern about nitrate and regulations influenced BMP adoption more often than other BMPs tested.

Summary

Outreach models suggest that building awareness about the water quality problem to be addressed is the first step towards influencing change. Survey results from Colorado suggest that adoption of certain nutrient management BMPs was affected by producers' water quality concerns. However, other factors such as producer characteristics and cropping system had a larger influence over whether producers adopted BMPs. Barriers to change seem to be associated with water, cost, time or labor as opposed to lack of information.