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## SECTION 6: Challenges and Opportunities

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## Challenges and Opportunities



During the course of the listening session, participants provided input and ideas on topics critical to success in using recycled water for agriculture. Participants chose one of four breakout sessions to discuss issues around specific topics. Each group focused on a specific question and identified some challenges, opportunities, and specific policies or actions that USDA might make or take.

In general, many research, education, and/or outreach challenges were raised around the topic of water reuse for agriculture. Participants felt that USDA should take an integrated approach to water quality management and suggested interdisciplinary teams and approaches. Some of the identified research needs are basic, while others lend themselves to more applied approaches with considerable involvement by various stakeholder groups (producers, consumers, markets, wholesalers, retailers, and regulators were some key groups mentioned throughout the sessions). All breakout groups identified many educational needs for the different stakeholder groups above.

## Which Crop for Which Place with What Water?

Participants were excited about the opportunity to augment water supplies and alleviate pressure on water resources through use of recycled waters. Being able to accurately and easily match the qualities of different waters with options for tolerant crops in the most appropriate locations has great potential for agriculture. Discussing challenges around this question helped to elucidate some of the opportunities for USDA.

More research is needed to investigate both plant tolerances to waters of varying quality and particular constituents in the water with potential plant toxicities. The group also cited a need to set base standards for plant growth tolerances and production. Research on salt tolerant plants would increase options for growers who use recycled water in their production operations. It could also lead to identification and development of salt collecting crops for water treatment and recycling purposes. There are questions surrounding maintenance of soil quality

regarding salts and other constituents and the fate and transport of these constituents not taken up by crops. There were also questions about data on the quality of recycled water, specifically in comparison with other irrigation water quality. There are challenges to develop effective and efficient recycled water quality testing parameters and more rapid procedures based on sound science. From earlier presentations on pathogens and health risks, participants recognized that water testing should focus on risk assessment and pathogenicity.

**KEY QUESTION:**  
 IN ORDER TO BE SUCCESSFUL  
 WITH RECYCLED WATER,  
 WHICH CROP IS BETTER SUITED  
 FOR WHAT LOCATION AND  
 WHAT QUALITY OR SOURCE  
 OF WATER SHOULD BE USED?

RESEARCH ON SALT TOLERANT PLANTS WOULD

INCREASE OPTIONS FOR GROWERS WHO USE RECYCLED WATER

IN THEIR PRODUCTION OPERATIONS.

IT COULD ALSO LEAD TO IDENTIFICATION AND DEVELOPMENT OF SALT COLLECTING CROPS FOR WATER TREATMENT AND RECYCLING PURPOSES.

**Alfalfa**

**Kikuyugrass**

**Paspalum**



## Which Crop for Which Place with What Water? (cont'd)



ACTIVE MANAGEMENT REQUIRES MATCHING APPLICATIONS BASED ON IRRIGATION SYSTEMS, CROPS PRODUCED, AND SOIL OR GROUNDWATER CONSIDERATIONS, WHILE TAKING INTO ACCOUNT THE LEVEL OF TREATMENT AND THE QUALITY OF RECYCLED WATER.

Therefore, research on pathogens in recycled water and the fate and transport of these organisms needs to be addressed. Finally, more research is needed on how to handle, and what to do with, the brine resulting from recycling and treating waters for reuse.

Applied research and outreach need to focus on decision support to enable informed decisionmaking and enhance adaptability and diversity in agricultural production operations. For example, the participants viewed the quality of the recycled water as a primary driver for decisions. However, several breakout groups discussed decision support and educational information regarding crop production options in the context of the quality of different waters available and related plant tolerances.

Participants discussed educational challenges and opportunities, including the need to learn and share information about successes and failures of water reuse in agriculture. A clearinghouse for this type of information was recommended to help reduce barriers to expanding the use of recycled water in agriculture. Although a separate public perceptions group focused on perception and acceptance (see below), this group also addressed these challenges and suggested several opportu-

nities for extension education. Group members noted that the three major challenges might be public/consumer acceptance, producer acceptance, and purchaser/wholesaler/retailer acceptance of using recycled water in agriculture, particularly related to food/fresh market crops. It appeared to the group that there are noticeable differences in regional or state acceptance of water reuse for agriculture. Other opportunities for USDA include educational and extension programs addressing crop diversification in agricultural systems using recycled water and ways to make these decisions easier and more informed to increase the adaptability of agricultural systems given the pressures on water supplies. There was discussion about opportunities to use recycled waters on new types of crops, including bioenergy crops, turf production, or lawn and landscaping irrigation in residential situations. Expanded dialogue and cooperation between USDA and EPA were recommended.

## Reducing Human Exposure During Production and Understanding Exposure Risks for Consumption

Participants in this group expressed a wide range of thoughts and suggestions to USDA during this breakout session. In general, there was great enthusiasm in this group—as well as in others—about the opportunity to increase available water supplies and water management using recycled water, thus increasing sustainability. A goal identified for USDA is to make recycled water the best available source of water for irrigation.

The group discussed at length significant opportunities for education and enhancing public understanding, including water reuse and water management in general. These opportunities should include finding creative ways to communicate, exploring new outlets for communication, and comparing recycled water to other irrigation water sources. Workers, supervisors, growers, trade groups, retailers, and consumer agencies are among the many groups to target for future educational opportunities. Improving scientific understanding about human exposure and risk and risk assessments are necessary to reduce uncertainty and to increase our ability to address concerns or perceptions about worker safety, food safety, and to test effectiveness of best management practices (BMP).

More research is needed to understand the exposure risks associated with water reuse. The group described “fear of the unknown” as a challenge and stated that research and data can address those concerns. Funding for research on these issues for water reuse was an opportunity targeted by this group. They also felt there were opportunities to partner with other agencies or organizations on this research. Some specific research topics included addressing new or growing threats, such as pathogens and other emerging contaminants (e.g., pharmaceuticals and hormones), constituents or potential contaminants in recycled water (e.g., trace elements), protection against health threats and BMPs for production, processing, and environmental protection (e.g., do buffers help?), and quality control and packaging considerations. Additional research topics included risks to humans (e.g., exposure routes), effects on wildlife, and soil accumulation and standards for cropland protection (from trace constituents or contaminants). The group recommended comparative risk analysis (recycled water vs. other water sources) to provide context for interpreting communication about risk. There is a need for independent review to address credibility challenges towards the science basis and alter inaccurate perceptions.

Numerous opportunities for education and outreach were discussed. The public needs to be more aware of the benefits of using recycled water; however, the stigma associated with recycled water use, consumer confidence, and public perception issues are major challenges. There is a great need to gain the confidence of consumers and decisionmakers through science-based education, clear and effective risk communication,



Photo courtesy of NRCS

**KEY QUESTION:**  
**WHEN AND WHERE IN THE FOOD  
PRODUCTION AND CONSUMPTION  
PROCESS ARE THE POINTS OF RISK?**

## Reducing Human Exposure / Understanding Exposure Risks for Consumption (cont'd)



transparency, and honesty. One suggestion was to bring any doubts and criticisms into the process/discussion and to partner with those who raise concerns. The group felt that more funding was needed to establish extension agents for recycled water, that funding for water reuse extension programs was a priority, and that a network of these agents should be formed. The need for credibility and reliability, strong science basis, and clear and effective communication and education campaigns fits in well with the role of extension.

Summarizing existing information and data will be critical to producing educational materials. Several target audiences were noted for educational programs and outreach, including workers, supervisors, growers, trade groups, retailers, and consumer agencies. Participants discussed specific challenges related to work forces and reducing human exposure, including low scientific literacy, limited education, and language barriers (meaning that people in the water industry tend to use technical language that workers and consumers may not understand). Workforces tend to be maintained over long periods—sometimes across generations. Educating workforces where multiple generations continue to work together in the fields allows for generational transference and provides for long-term retention. Training supervisors and growers/managers/owners would be critical elements to a successful education program for agricultural water reuse.

Some challenges or approaches to reduce exposure during production include signage, restricted access and waiting periods (if necessary), personal protective equipment, sanitation facilities for workers, and site supervision. For consumers, education on what to wash (in terms of produce) can reduce exposure risks. In addition, quality control measures and packaging considerations can help reduce risks to consumers.

Additional opportunities for recycled water users could include irrigation for golf courses or rangelands. These applications have a lower risk for workers and involve non-food crops, much like the mention of bioenergy crop irrigation in another session or the use of recycled water in the bioenergy production process. The group discussed using the media to deliver messages, but noted that, in the interest of accuracy, the media needs to understand the material. Participants also suggested that local spokespeople could help to encourage public understanding among their peers. They identified a role for USDA in outreach, stating that USDA needs to take the lead on recycled water, partner with other agencies and organizations, and encourage use of recycled water through incentives and science-based policy-enabling implementation. USDA should also help develop standards for croplands under cultivation to prevent contamination. Participants noted that irrigation water is not regulated and that transparency is needed in the regulatory process and in dialogue among agencies.

## Improving Public Perception and Acceptance

This group was excited about using recycled water to offset the use of fresh water sources, the economic benefits, and benefits to communities. However, addressing perceptions and behaviors is a major challenge. It was clear that in each breakout session, no matter the topic,

all conference attendees ultimately noted that the greatest challenge for water reuse in agriculture might be the perception and willingness of the public to accept its use to produce their food. There are several specific challenges and opportunities related to perception and acceptance of this technology and water resource for agriculture, and this breakout group was both creative and strategic in its suggestions. Most suggestions involved targeting educational opportunities to specific groups to increase their knowledge and understanding of the facts, or improving the perception of recycled water through outreach programs.

Several groups discussed partnerships and collaboration to improve effectiveness in addressing public perceptions and acceptance. Working closely with the agriculture community and farmers was strongly suggested. Closer and more regular collaboration with the media was another repeated suggestion in this group. Partnerships were recommended with USDA and between USDA and non-governmental groups (which some suggested might seem more trusted by the public), as well as with state and regulatory agencies. The group's final summary recommended more regional cooperation on educational programs.

Group participants noted specific challenges and opportunities dealing with funding for water reuse programs. Funding could be applied in several ways, including educational programs, outreach efforts, media campaigns, research needs and risk assessment, or for certification of or planning for irrigation water sources. Some of the suggested educational opportunities were to increase awareness of water resource issues in general for the public, for officials and decision-makers, and for members of the media. Public outreach and education were recommended before and during the planning stages for water reuse projects. This kind of early engagement was seen as critical regarding formation of perceptions and acceptance of uses. An informational show or DVD could be produced and used to tell the story and successes of recycled water use. Educating buyers and consumers of the benefits of using recycled water is critically important to perception and acceptance. There was also discussion about school programs, including tours of water reuse facilities, to educate children and their parents.

Participants recommended standardizing terminology and coordinating water resource messages for educational and outreach efforts. A general paradigm shift is needed to influence public perceptions and willingness to accept recycled water. Recycled water should be seen as a resource, not as a waste. This applies to regulatory approaches as well.



**A GENERAL PARADIGM SHIFT IS NEEDED TO INFLUENCE PUBLIC PERCEPTIONS AND WILLINGNESS TO ACCEPT RECYCLED WATER. RECYCLED WATER SHOULD BE SEEN AS A RESOURCE, NOT AS A WASTE.**



## Improving Public Perception and Acceptance (cont'd)



### KEY QUESTION:

HOW DO WE BETTER UNDERSTAND

WHAT THE PUBLIC FEARS?

Participants saw a need to overcome negative messages in the media and felt that, in some circumstances, the “issues were getting highjacked.” Given the focus of this session, much discussion centered on the media and the messages they provide to the public. Communication should be ongoing, not just during times of crisis. Communication must be science-based, should report relative risk, and should not involve speculation; in times of crisis, it is very difficult to overcome negative portrayals or inaccurate accusations—people remember these messages. One way to overcome a negative portrayal is for USDA to release comments that correct the record of facts once the crisis is understood. Non-governmental groups, which may have greater public trust, could help with this as well. To build public confidence and trust there needs to be transparency and to partner with trusted groups. Independent, third-party review or endorsements from environmental or health and safety groups would build credibility and reinforce the science on the issue. Public research could serve as an unbiased source of information, but more funding is needed for public research on recycled water and its properties or on risk assessment. Lastly, certification of recycled water and other irrigation water could reassure both agricultural producers and consumers.

Development of rapid response and outreach teams comprised of regional outreach and technical experts, state agencies, and local stakeholders could respond in crises and serve as a media resource. In other situations, they could share success stories, collaborate on outreach strategies, or assist in formulation of simple, clear policies.

## Management Actions to Improve Irrigation with Recycled Water

This group discussed actions and approaches related to some of the challenges to implementing the use of recycled water for agriculture. In general, the group identified integrated approaches for water quantity and quality management, as well as for soil salinity management.

Groundwater concerns and potential issues associated with recycled water use need to be addressed, including development of guidelines to assess groundwater. Active management of salt buildup related to total dissolved solids in recycled water is necessary to prevent problems and other considerations that might include crust formation and runoff from raindrop impact,

and drainage water management and leaching into groundwater. Regional salinity task forces could provide management of soil and groundwater concerns. One advantage noted by this group was the nutrient value of recycled water used for irrigation. Many of the farmers that interacted with conference participants pointed this out as a positive feature.

Much of the discussion and questions focused on the need to develop national standards for the quality of recycled water and for other irrigation water sources. Any such standards must address crop/plant/industry and environmental needs; developing these standards would require a collaborative agency approach. Standards must be science-based. There are many research needs to develop and monitor the standards, and educational needs to implement and manage them. Agencies to be involved in this should include EPA, USDA, USDOJ Bureau of Reclamation, and the Food and Drug Administration.

### KEY QUESTION:

HOW DO WE MANAGE THE DELIVERY, STORAGE, AND USE OF RECYCLED WATER ACROSS GROWING SEASONS AND YEAR 'ROUND?



STANDARDS MUST BE SCIENCE-BASED. THERE

ARE MANY RESEARCH NEEDS TO DEVELOP AND

MONITOR THE STANDARDS, AND EDUCATIONAL

NEEDS TO IMPLEMENT AND MANAGE THEM.

AGENCIES TO BE INVOLVED IN THIS SHOULD INCLUDE EPA, USDA, BUREAU OF RECLAMATION, AND THE FOOD AND DRUG ADMINISTRATION.

## Management Actions to Improve Irrigation with Recycled Water (cont'd)

**FINALLY, A MAJOR RECOMMENDATION FROM THIS GROUP CHARGED USDA TO DEVELOP AND ISSUE A POLICY ON THE USE OF RECYCLED WATER AS A RESOURCE FOR AGRICULTURE.**

However, it was noted that farmers are averse to regulations. An alternative approach is for USDA to offer voluntary certification of irrigation water. A minimum level of standards would help to increase confidence in the use of different water qualities in different situations and might make these decisions easier and the public more willing, while also ensuring environmental protection. A survey of existing state standards and a database of irrigation water uses would be starting points for such an effort. Development of such national standards might also necessitate development of rapid, accurate, and effective testing technologies (a research need) for pathogens and other important water quality constituents either for regulatory requirements or to aid in irrigation management decisions (such as which water can be used in what circumstances).

Some other considerations related to regulation were raised. Standards and regulations must be applied in a consistent and logical manner. For example, questions were raised as to why low quality irrigation runoff is permitted to leave a site, but recycled water requires a National Pollutant Discharge Elimination System permit. Other questions related to how water boards apply anti-degradation policies, and about environmental and social justice. There is also a need to address water rights (in the West) to maintain surface water flows and quality.

Operationally, there are challenges and opportunities as well. Operational and monitoring standards would help to assure the quality of recycled waters for agricultural users. Developing site management guidelines for different irrigation applications would be helpful to managers making these decisions and ensure proper and responsible use. Active management requires matching applications based on irrigation systems, crops produced, and soil or groundwater considerations, while taking into account the level of treatment and the quality of recycled water. This is a major research need and must include an integrated approach to whole system optimization.

Finally, a major recommendation from this group was for USDA to develop and issue a policy on the use of recycled water for agriculture. This policy should emphasize the “value” of water and the value of recycled water as a resource. It should also note the opportunity to supplement diminishing water supplies in many parts of the nation and take credit for the triple bottom line when using recycled and reclaimed waters to increase the sustainability of U.S. agriculture.



FORMATION  
A WATER  
REUSE CAUSAS?

to have an educational  
outreach



TO FORM  
A COALITION  
W/UNIVERSITY  
SPONSORSHIP

extension  
- communities  
of practice?

HOW TO  
GET HIGH  
LEVEL  
ENDORSEMENT?

National  
Academy of  
Sciences

ZEN & THE ART  
OF WATER CYCLE  
MANAGEMENT



6 PT.?

ARE THERE  
PRE AUTHORIZATION  
FOR EQUIP PROGRAM  
W/RECYCLED H<sub>2</sub>O

→ Conservation  
Security program  
→ CIG.  
→ EQUIP

FARMERS  
SIDE

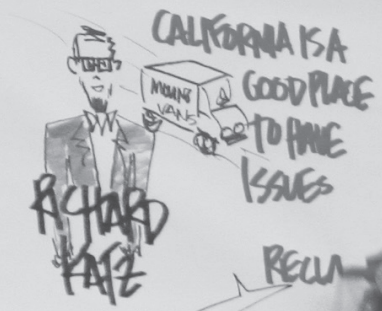
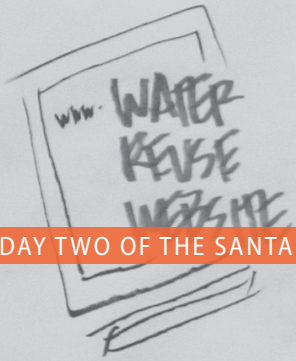
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KEY TO SUSTAINABILITY

ACKNOWLEDGE  
RESOURCE LIMITS  
& LEVERAGE  
RESOURCES

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