National Program 211 – Water Availability & Watershed Management Assessment Report

Executive Summary

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The review team was highly impressed with many aspects of National Program 211 on Water Availability & Watershed Management (NP211). ARS scientists are clearly doing critically important work on topics of great national interest that no other group of researchers is doing. In many areas, it is clear that if this work was not being done by ARS scientists, there would be critical gaps in agricultural and environmental science with significant impacts on food production and environmental quality. NP211 scientists should be proud that they have made significant accomplishments on important problems. These accomplishments are evident in the impressive list of publications in high quality refereed journals and also in numerous non-refereed publications targeted at specific user groups.

While the theme of our review is positive, there are also challenges and opportunities for improvement. The impact of much ARS research is not as high as it should be due to limitations at the interface between basic and applied research and between the producers and users (stakeholders) of scientific information. The impact of NP211 research is also reduced by the diverse and dispersed nature of the research program. More targeted themes, and more coordination among different research groups within ARS and with Universities and other agencies might increase impact. And finally, impact is limited by the scope of disciplinary expertise within the group of ARS researchers. Expertise in social science and in other disciplines of environmental science, e.g. ecology could increase the impact of ARS research, either through collaboration or direction inclusion of researchers from these disciplines in the research group.

Some overview comments on the six problem areas covered by NP211:

Problem Area 1: Effectiveness of Conservation Practices. The need for long-term research in agricultural watersheds has been identified as a priority and a challenge for at least three decades. It is extremely gratifying to see this challenge being addressed with the Conservation Effects Assessment Program (CEAP) in a compelling and powerful way. CEAP has an impressive mix of monitoring, experiments and modeling and an impressive structure of collaboration between ARS, NRCS and University researchers. Recent progress on database development and information management, a huge challenge in long-term research, is very impressive. The centrality of the collaborations that underlie the success of CEAP should be more clearly highlighted and are threatened by the continued erosion of support for traditional Land Grant University research programs.

Problem Area 2: Irrigation Water Management. ARS work on improving the efficiency of irrigation, use of recycled water and the challenges of salinization are high impact and critically important. Much of the work with sensors and software is state-of-the-art and high impact. This is work that is critical to food security and environmental quality that just would not be done if NP211 scientists were not doing it. Some of the more agronomically-oriented work overlaps with the traditional scope of University research and/or with private industry. There should be a

focus on collaboration and support of University work, and on interactions with private industry that focus on better use of resources and/or improvement of the environmental performance of production systems.

Problem Area 3: Drainage Water Management. This is an important research area that ARS has lots to contribute, but there was a surprising disconnect between what was promised in the objectives and what was delivered in the specific research accomplishments. There was some fine, but too narrowly focused specific research, and not enough application of existing promising technology to larger scales, with design specifications, as was promised in the research plan.

Problem Area 4: Integrated Soil Erosion and Sedimentation Technologies. Soil erosion is another research area where ARS scientists do critically important, unique work that no one else does. Work in NP211 included a powerful mix of targeting, modeling and control techniques. Some of the work overlaps with the traditional scope of University research. Some of the work could be more cutting edge, with more focus on truly novel science.

Problem Area 5: Watershed Management, Water Availability, and Ecosystem Restoration. NP211 has made some fundamental contributions in this research area with long term data, models and technology that are state-of-the-art and high impact. ARS is clearly a leader in the application of remote sensing to agricultural lands. Much of the work especially that related to offsite impacts requires a broader context and interaction with ecology, especially new ideas about "ecosystem services" and landscape connectivity. Some type of overarching framework for the climate change work and how it interacts with water would also be helpful. We hope that long-term data will be made publicly available in a timely way.

Problem Area 6: Water Quality Protection Systems. NP211 has made some fundamental contributions in this research area with state-of-the-art research on fertilizer management and pollution mitigation technologies. The research could benefit from a broader context and basis in the biogeochemistry that underlies contaminant dynamics in the landscape and less of a focus on specific fertilizer practices. There were some surprising disconnects between what was promised in the objectives and what was delivered in the specific research accomplishments in this research area; there was more highly specific and small scale work and less analysis at field, farm, and watershed scales than was promised.

Some more cross-cutting issues and thoughts for the future that emerged from the panel discussions:

- Interaction with stakeholders is an ongoing challenge for ARS. While this is clearly a priority, most ARS scientists have expertise in the biophysical sciences and little or no expertise in outreach and extension. More systematic thinking about intended audiences, and more deliberate interaction with NRCS, Cooperative Extension and/or inclusion of social scientists (including resource or ecological economics) and/or outreach specialists within ARS should be considered.

- Agricultural research in the U.S. can be viewed as a stool with three legs; ARS, NRCS and the Land Grant University system. This collaborative structure makes U.S. the world leader

in agricultural and environmental sciences. Because each leg is dependent on the others, it is important that all these groups acknowledge and support the other.

- Should there be more overarching coordination of efforts within NP211? The project clearly addresses issues of great national importance, and there is national-scale planning, but the Accomplishment Report makes it clear that the work is carried out by semi-independent scientists working at a large number of stations across the country. It should be possible to have tighter coordination of the effort that could increase impact without stifling the creativity and productivity of these scientists.

- The questions about coordination are exemplified in the area of modeling. A large number of models are used in NP211, for multiple purposes (research synthesis, decision support). An effort to determine just what ARS is hoping to accomplish with specific user groups might be warranted.

- The format of the Accomplishment Report and the charge to the review team caused some confusion among the review team. The descriptions of the individual research projects were too brief to comprehensively review, yet there were few overarching themes that would foster analysis of the "big picture" of the research program. It is clearly a great challenge to prepare these Reports, but it was unclear to this committee that this was the optimal format. Some suggestions for alternative formats include:
    - The write-ups should follow the assessment criteria more closely. Authors should carefully keep in mind the assessment criteria that the reviewers will be using to evaluate the reports.
    - It might be helpful to start with a frank overview of successes and limitation of the program. This could either be an oral presentation (45 minute) at the beginning of the panel meeting, or something written at the beginning of the document – an assessment from the program leader of what the project was trying to achieve, what went well and what did not go so well.

- The panel is aware that several ARS stations are being closed. There is great concern about the potential for loss of long-term data and a need to archive records and samples. This should be a high priority as institutional memory can fade quickly.

- Given tight budgets and the need to prioritize, one idea might be for ARS to always try and focus on research that no one else is doing, that fills critical needs in agricultural and environmental science. Some of these areas are highlighted above; long-term research, salinization, erosion, fertility. There is concern that key areas of basic agricultural research may become neglected and simple problems, say with soil fertility, that have become rare may re-emerge.