

**NATIONAL AGRICULTURAL RESEARCH, EXTENSION,
EDUCATION, AND ECONOMICS ADVISORY BOARD**

**HIGHLIGHTS OF FOCUS SESSIONS:
BIOPRODUCTS, WATER AND
1890/1994 LAND GRANT INSTITUTIONS**

October 24-26, 2006

The NAREEE Advisory Board commissioned white papers and heard presentations on the roles and responsibilities of REE agencies in three areas:

1. Bioproducts at work (a followup to the focus session on bioenergy in March 2006);
2. Water quality and quantity; and
3. Engaging USDA/REE in the success of the 1890 and 1994 land grant institutions.

The planning committees that organized these focus sessions will develop more complete reports and recommendations on these topics in coming weeks. The following is a summary of the Board's deliberations during these focus sessions.

Bioproducts at Work

From the point of view of the agricultural value chain, bioenergy and bioproducts alike represent new uses for familiar crops and landscapes. In fact, ethanol and biomaterials have been around for over a century, but they have languished (in favor of petroleum-based energy and materials) because of a lack of political support. That situation is beginning to change, and both ARS and the land-grant universities have enormous technical assets that can help to strengthen the emerging "bioeconomy."

In the short term, the greatest success will come from picking the "low-hanging fruit" – that is, directly replacing familiar oil-based products (e.g., fuels, lubricants, plastics) with equivalent bioproducts from existing crops. In the long term, however, technological success will depend on developing entirely new crops, new products and new processes. Several speakers cautioned that technological process is never simple nor linear, and here too success will depend on both (1) translational research and technology transfer (moving scientific discoveries into commercial systems), and (2) a total systems approach (integrating traditional agricultural research and economics with their larger social and environmental impacts).

For agricultural policymakers, the challenge will be to focus attention on what the public wants (e.g., both cheaper energy and sustainability) while also focusing on the long term (there is no quick fix) and the larger picture. False starts in the past have left some researchers reluctant to pursue these technologies, a reluctance that can be overcome only by higher and *sustained* funding for bioenergy and bioproduct research. Industry, for its part, doesn't see bioproducts as anything "magically different" – it's just a new feedstock for chemical plants. What they would like to see is an equal footing for oil- and bio-based products, and a list of approved inputs for the evolving Biobased Products Preferred Procurement Program.

The debate over expanding the bioeconomy, particularly if approached from a total systems perspective, will also provide an opportunity to address a number of important, collateral issues. These include not only conservation (which never gets enough attention in energy policy) and global warming (which continues to be ignored), but also environmental impacts and even water (a bigger challenge than currently acknowledged). At present, production of a gallon of ethanol consumes four gallons of water, and bioenergy cannot succeed if it becomes merely another drain on the Ogallala aquifer.

Board members also asked whether USDA and its university partners currently have, or can quickly develop, the research and extension workforce that will be required to pursue this new mandate. Some members suggested that long-term success would require larger and longer-duration grants than currently available from USDA, as well as federal funding for translational research. Given the need for multidisciplinary approaches and teamwork, other members suggested that success would also require changes in professional reward systems that would encourage collaboration rather than individual effort.

Water Quality and Quantity

Water supplies will pose an unprecedented challenge to global agriculture in the 21st century, and availability already constrains productivity in some regions. Rising energy costs, growing urban demand, and the droughts associated with global climate change will place growing pressure on this limited resource. In some regions both surface and ground waters are already overdrafted, and subsidies distort water policies around the world.

The United States cannot escape these global trends forever. True, the productivity of water used in U.S. agriculture continues to increase, with total withdrawals lower today than they were in 1980, lower by 25 percent on a per capita basis. But no major dams have been built since 1970, and new water supplies are constrained by a variety of physical, environmental, economic, and political factors. The key for all sectors, including agriculture, will be to increase the efficiency with which water is used and to reduce impacts on water quality. Notably, this will include the development of alternative sources (e.g., reuse, reclamation and recycling) and the integration of climate into water planning (adaptation and mitigation).

Energy production and agricultural irrigation continue to be the major consumers of U.S. water supplies. The two are not unrelated, since energy costs affect the price of water lifted from aquifers, especially when farmers need to drill deeper and deeper to lift that water. With the exception of the Ogallala, however, there is no data on aquifer water levels, and indeed there is little or no data on many of the most pressing questions about water quantity and quality – streamflow, pesticides and emerging pollutants, the effectiveness agricultural BMPs, etc. – and little confidence in the existing models that are supposed to make sense of these data for farmers and policymakers alike.

Several speakers stressed the need, not just for better models, but for better integration of those models. Aquifer models, for example, should include impacts on ground and surface waters, as well as the environmental impacts of land subsidence. Models should be built on good data, of course, but they should also address larger scales in both time and space. Here as in biomaterials, there is a need for a larger systems approach that would capture the full costs and impacts of water supplies and uses.

REE agencies are addressing many of these needs. ARS will spend \$63.7 million in FY2007 to support research on water availability, about equally split between quantity and quality, including such issues as snowpack management in the West and emerging pollutants such as pharmaceuticals and bioendocrines. CSREES supports additional research in areas such as drought- and salt-resistant plants, water reuse and the wider adoption of available pollution control devices. ERS tracks a variety of water resource indicators and studies the impact on agriculture of environmental policies and conservation programs. NASS collects data on irrigation practices, energy costs, pesticide use, alternative crop coverage, and other pertinent indicators.

Several speakers appealed to USDA and national policymakers to look both ahead and behind – to rethink the goals of U.S. water policy based on real numbers, to integrate land use and water use, to balance the demands of agriculture and urban development, and to monitor the results in order to manage the transition of irrigation agriculture.

Board members added that, while science-driven policy is rare, science-informed policy is not, and they encouraged REE agencies to continue their efforts to inform the debate at both the policy and the production level. One member suggested a pilot study of the interaction of growth and agriculture on a regional or watershed level, modeled on the “audit” conducted by the Charles River Coalition in New England. Others pointed out that rural communities have less political clout than big cities, which puts them at a disadvantage in fights over water rights. Another suggested that producers will adopt new water technologies when they perceived that (1) there’s a problem, (2) the problem is serious, and (3) if they don’t do something for themselves, the government will do it to them. Several members also pointed to the need for water quality and quantity markets, but added that these markets only work when there is a cap on either supply or quality.

The program planning committee offered the following list of recommendations from this discussion:

- Continue research to improve the efficiency of water use in agricultural
- Link research results to policy instrument, incentives and market-like mechanisms to drive efficiency of water use and protection of water quality.
- Conduct research to compare effectiveness of BMPs vs. economic incentives vs. market-based mechanisms in achieving better water quality outcomes.
- Determine how land use and land management can be changed to achieve maximum benefit to water quality.
- Develop a risk-management framework for thinking about water quality and quantity, functional integrity, and sustainability.
- Find ways to make regulatory processes more efficient in accommodating changes in water demand in the West.
- Conduct research on reuse, reclamation and recycling of water as tools for increasing the efficiency of water use and quality protection.

Engaging USDA/REE in the Success of the 1890 and 1994 Land Grant Institutions

The 1890 land grant institutions include 18 historically black colleges and universities with a combined enrollment of about 100,000 students, about 70 percent of them minority. They have the twin mission of (1) education and (2) research and education, with a particular emphasis on limited-resource persons, limited-wealth communities, and providing goods and services for “the least of these.” In terms of agricultural research, 1890s tend to focus on farmers and rural communities, rather than commodity crops or industrial agriculture. Consequently, their extension efforts focus on families, nutrition and health, as well as alternative crops and rural entrepreneurship. At the present time, however, the 1890s face three challenges: declining resources, increasing competition for minority faculty and students, and declining support for affirmative action programs. They need help from USDA in a number of areas, including facilities, curriculum enhancement, professional development and retention of faculty, and the relaxation of matching requirements for some USDA grant programs.

The 1994 land grant institutions include 34 tribal colleges that are chartered by their tribes or nations, rather than the states. Collectively they have an enrollment of about 3,000 students, most of them from poor and isolated communities that are hungry for education but historically underserved. They provide remedial and AA-level core courses, plus a “culturally appropriate” agricultural curriculum (includes sustainability, restoration and native plants) and in-service training for community and USDA employees in accounting, management, etc. Because many of their graduates go on to four-year schools, there is a concern with the transferability of their credits. Like the 1890s, they need money for facilities, strategic planning and faculty development. Unlike the 1862 and 1890 institutions, however, the tribal colleges don’t have an Extension liaison on every campus; they need closer links and communication with USDA, but they would also welcome collaborations with 1862s and 1890s. Tribal representatives pointed to bioenergy as a possible area for collaboration – after all, Native Americans control 18 million acres of well-managed forests and 36 million acres of grassland, in addition to 40 percent of U.S. coal reserves, and there is further potential to develop solar power in the Southwest and wind power in the Northern Plains. They also have 5,000 years of experience breeding corn that will grow on 12 inches of precipitation.

CSREES has a scholars program for the 1890 institutions, but there is no such program for the 1994s. Another initiative that might hold promise for 1890 institutions is teacher exchanges or rotating faculty programs, which would also expose 1862 faculty to their 1890 counterparts and lay the foundation for future collaborations. The 1994s, for their part, would also welcome research partnerships, but they have a more pressing need for Extension agents and cooperative agreements with other USDA agencies.

The program planning committee developed the following preliminary recommendations in response to these presentations:

- Increase funding for 1890s and 1994s under USDA’s formula funding, facilities programs and capacity-building programs.
- Support the creation of faculty and student exchange programs among 1862, 1890 and 1994 institutions.
- Give 1890s and 1994s a greater role in USDA/REE advisory boards.
- Increase funding for centers of excellence programs.
- Provide additional funding to NAL to expand library access for 1890s and 1994s.
- Encourage the collocation of REE centers on 1890 and 1994 campuses.

- Provide funding for regional 1994 liaisons.
- Provide more capacity-building grants to 1890 and 1994 institution.
- Modify RFPs to include greater integration of research, extension and education. In particular, modify CSREES programs for 1890/1994 institutions to place more emphasis on their *education* component.

Board Matters

The Board unanimously reelected Martin Massengale and George Hoffman as chairman and vice chairman, respectively. They also elected the following members to the Executive Committee: Martin Apple, Walt Armbruster, Carol Keiser, Daryl Lund, David Thomassen, Mary Wagner, and James Zuiches.

Action Items

- ERS will provide Board members with report on its workshop, “Exploring Rural Entrepreneurship,” 26-27 Oct 2006.
- NAREEE staff will consolidate on Board website a list of the topics of all focus sessions, with recommendations made by the Board and responses by REE.
- NAREEE staff will circulate minutes of the August listening session within 30 days.
- NAREEE staff will circulate draft Bioenergy and Germplasm reports to Board members as soon as they are ready for review.
- ARS and CSREES will provide the Board with a breakdown of the percentage of formula and competitive research funding goes to bioenergy and bioproducts.
- Bioproducts program committee will write up findings and recommendation as an addendum to the bioenergy report, stressing the need for research on second-generation cellulosic ethanol, items for the procurement program, total systems approach, and greater emphasis on animal byproducts and processing waste.
- REE agencies will present their written reports to the Board in a uniform format. Daryl Lund will develop and circulated a sample format.