



CSREES Administrator's Report to the Partnership

November 2007

The mission of the Cooperative State Research, Education, and Extension Service (CSREES) is to advance knowledge for agriculture, the environment, human health and well-being, and communities.



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Message from the CSREES Administrator

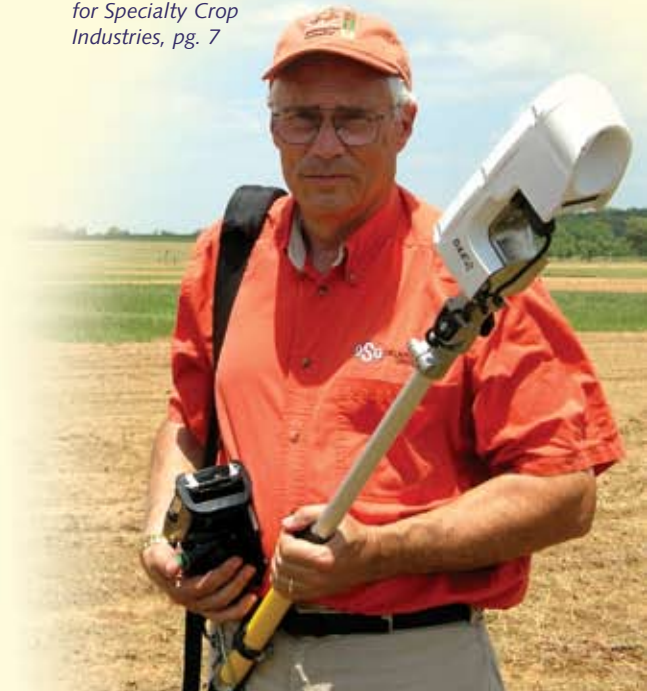
The most important job of scientists and educators is anticipating the challenges of the future; often, these issues, concerns, and possibilities are not yet on the horizon. The tip of a sail will occasionally indicate which way the distant wind is blowing, but often scientists and educators have only the unconnected paths of seemingly divergent trends to provide any sort of compass. Yet, if we fail to push toward the horizon, or speculate what skills, and maybe knowledge, people will need long into the future, what is the sustained value of science and education? We need to constantly demand that some parts of our system take a long-view to guide our immediate actions; that we take risks in exploring and developing tools that can help us address mysteries we have yet to meet.

How do we begin such an esoteric task? First, I think, we listen—not just to the loudest voices, but also to today's fringe. More likely than not, today's fringe will be tomorrow's fringe. Occasionally, however, the angle of perspective of those outside the mainstream converges with the broad view, or at least gives us a position from which to test a new approach. This recognition is why the National Research Initiative's recently released Request for Applications asks for proposals about the social and economics issues that may arise from developing and adopting nanoscience and technology in agriculture.

We also need to listen to scientists and educators who can see the future possibilities enabled by today's discoveries and new scientific approaches, often in unrelated fields. The pace of discovery for the benefit of agriculture has been enhanced not only by the revolution in molecular and cell biology, but also by advances in hydrology, climatology, social theory, and statistics. We routinely add multidisciplinary scientists to our teams to give us insight into a portion of our traditional research. Those scientists could be sounding boards about where they think our core programs are headed into the future. The need to plan with others has led us at CSREES to invite a much broader range of scientists to research planning meetings. For example, without risk management experts, our approaches to food safety alternatives may not be adopted; without engineers who confer with tree fruit breeders, we may never be able to address the harvest issues that constrain growth and profitability of an industry that produces something that we recommend people should eat in greater quantity.

We need to listen to students, both those who elect to study the fields we have studied, and those who are questioning whether those fields will be relevant in their future. There is no greater need than to expand agriculture from a food, feed, and fiber producer, to a bioenergy supplier and a bioremediation tool. These new roles will require a new approach for substantial aspects of curricula in agricultural science,

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including economics and marketing. Preparing students for the 21st century world of agriculture is a major focus of new initiatives in higher education programs at CSREES. These programs have a strong foundation of youth development, which emphasizes science, technology, engineering, and mathematics.

Agricultural science and education, and the portfolio of investments managed by CSREES and its institutional partners, need to be recognized as part of the nation's discovery and educational priorities. Successful as agriculture has been in the past, in large part because of our multi-dimensional system of federal, state, and private support and integration, the world cannot survive without continuous attention to the harvest produced by the use of land, water, air, and sun. That is one constant truth, here and on the far side of the horizon.



Colien Hefferan, Administrator

On the cover: Oklahoma State University researcher John Solie demonstrates the hand-held version of the Green Seeker—a 'smart machine' that determines precise fertilizer or herbicide needs.

Grants.gov Paves Way Toward Paperless Grant Application Process

Grants.gov is the convenient one-stop shop to find and apply for federal grants.

Since Grants.gov was launched on October 31, 2003, CSREES has steadily increased the number of programs available to applicants. This year marked CSREES' implementation of all discretionary competitive grant programs. Transition of this magnitude is never simple and requires a remarkable amount of collaboration. CSREES was able to make this effort a success only by collaborating with USDA, other federal agencies, Grants.gov, and pilot institutions, such as Auburn University, Cornell University, Montana State University, North Carolina A&T State University, and University of Wisconsin–Madison.

Over 4,700 applications have been submitted to CSREES through Grants.gov during this year's implementation. The agency supported applicants during this transition by publishing help tips, frequently asked questions, and adopting the use of the standard research and related forms (http://www.csrees.usda.gov/funding/application_info.html).

CSREES and applicants alike are realizing the benefits of utilizing Grants.gov. Applicants now have a consistent look, feel, and process to apply for grants across federal agencies, and it is easier for applicants to find relevant federal funding opportunities. In addition, Grants.gov offers technical support to applicants when they have questions or problems related to the application process. For CSREES, Grants.gov has increased the accuracy and integrity of application data and led to other benefits, as well. More importantly, the partnership needs to maintain a dialogue on these process improvements.

CSREES is investigating additional ways to leverage Grants.gov in other areas of business, including Formula programs. The programs under consideration are McIntire-Stennis Cooperative Forestry, Renewable Resources Extension Act, Expanded Food and Nutrition Education, and Animal Health and Disease Research. More work and analysis are required before plans become final.

For more information, contact Jason Hitchcock of the Information Systems and Technology Management Unit at jhitchcock@csrees.usda.gov.

eXtension Nears Public Launch and Celebration

No discussion of agriculture in the 21st century would be complete without consideration of eXtension. On February 21, 2008, a switch will be flipped that will set off a nationwide transformation. It will formally introduce millions of Americans to the Cooperative Extension Service via eXtension, the nation's first 24/7/365 non-formal education and information system available on any Internet-ready device.

eXtension has been in development since late 2004 and will launch more than a dozen individual sites in February 2008. Additional sites will follow throughout the remainder of 2008 and beyond. Working groups, or Communities of Practice (COP), began forming and working in 2005 to develop content that brings the "best of the best" in various subject matter areas to the Internet. These groups work in eXtension's virtual collaborative "wiki space" to develop Frequently Asked Questions, Ask the Expert, learning modules, decision support tools, and learning lessons for the public.

What sets eXtension apart is the recognition that Americans today are turning more and more to the Internet for information, education, AND for social networking—a phenomenon bringing individuals with like interests together via technology. People today look to the Internet for building communities. eXtension recognizes this by building an environment that ensures relevance in the educational marketplace while exploring new frontiers using Web 2.0 social networking applications. At the same time, eXtension brings to new audiences and clientele the research-based, objective, and credible information and educational programs that Cooperative Extension is known for. Helping people build these new interest communities via eXtension allows Cooperative Extension to reach more Americans than ever before.

CSREES has been instrumental in the eXtension initiative since its beginning. Initial funding, representation on key leadership groups, and involvement in eXtension's annual review processes have all demonstrated this engagement. In addition, CSREES national program leaders are members of each COP, working closely with colleagues throughout the land-grant system.

eXtension has grown from 8 "pioneer communities of practice" to more than 21 working groups. An additional five COPs are expected to be named in Fall 2007. Topics featured as COPs in eXtension have come through a variety of processes. The initial application process included a review by a panel composed of directors, program leaders, and CSREES national program leaders. In addition, in 2007,

each of the Extension Council on Policy regions has been asked to identify, rank, and consider financial support for the development of Communities of Practice recognizing national and regional priorities.

The future looks more than bright for eXtension specifically, and Cooperative Extension in general. eXtension's branding tagline "More Mind Reach" truly sets the stage for its future...reaching more minds throughout the country with information and educational programs developed by the best minds in American higher education. Cooperative Extension directors and administrators have proudly endorsed their support for eXtension through 2011; thus, the celebration and launch of eXtension in February 2008 is just the beginning of a transformation that will only improve an already outstanding organization.

Contact Terry Meisenbach, director of eXtension marketing and communications, at Terry.Meisenbach@eXtension.org, or Greg Crosby, CSREES national program leader, at gcrosby@csrees.usda.gov, for more information.

CSREES and USDA Forest Service Partner to Prepare Forestry Graduates for the Future

The forestry industry is one of many employers across the country that are concerned about the serious loss of capacity as the current aging workforce retires, how dramatically different workplace skills and knowledge have become, and the need for continuous, transdisciplinary learning. Whether public or private, employers look to the nation's colleges and universities to prepare graduate students with knowledge, skills, and capability to engage in today's issues and tomorrow's needs.

The forest resources community identified its specific needs when the National Association of University Forest Resources Programs (NAUFRP) convened a specialty panel in October 2003. Under the leadership of Daniel Keathley, chair of the Michigan State University Department of Forestry, panel members delivered an assessment entitled "National Graduate Education Needs and Priorities in Natural Resources." This assessment prioritized four areas related to addressing the existing critical capacity shortage: decision sciences; land use and landscape analysis; ecosystem processes and forest health; and utilization technology. Panel members further recommended that quantitative analysis be done as an overarching need in all four areas.

National leaders from CSREES and the USDA Forest Service (FS) have discussed the Keathley assessment from the perspective of both educators and employers. CSREES and FS have joined to undertake a collaborative, long-term

effort focused on graduate education in the four critical capacity shortage areas. This joint effort will use the CSREES National Needs Graduate and Postgraduate Fellowship Grants Program (NNF), with each agency providing matching support of \$250,000 to provide a total funding amount of \$500,000 per year beginning in FY 2008, to run for at least 10 years. CSREES and FS are re-confirming the four critical capacity shortage areas with NAUFRP, both within the FS and with representative private/nonprofit forestry organizations. These four areas are expected to become Targeted Expertise Areas for the NNF.

NNF is a federal assistance grant program specifically designated for graduate degree programs and postgraduate training of the next generation of policymakers, researchers, and educators. Through a competitive grants process, the NNF program provides funding to support a student stipend and a cost-of-education allowance to eligible higher education institutions. Generally, eligible institutions are land-grant institutions; colleges and universities having significant minority enrollments and a demonstrable capacity to carry out the teaching of food and agricultural sciences; and other colleges and universities having a demonstrable capacity to carry out the teaching of food and agricultural sciences.

For more information, contact Dan Kugler, Deputy Administrator for Natural Resources and Environment, at dkugler@csrees.usda.gov, or Audrey Trotman, national education program leader for Science and Education Resources Development, at atrotman@csrees.usda.gov.

National Needs Graduate Fellowship Grants Program Update

The Food and Agricultural Sciences National Needs Graduate and Postgraduate Fellowship Grants Program (NNF), in partnership with eligible institutions of higher education, enables students to enter into and complete graduate-level training to meet the need for scientific and professional expertise in the food and agricultural sciences.

Unlike many other fellowship programs, students do not apply to CSREES for support; institutions apply for graduate training program support. Additionally, funds are available as support for an International Research/Thesis Travel Allowance. This approach allows National Needs Fellows to receive the widest training to acquire core competencies that ensure success in their graduate programs as well as opportunities to engage in experiential learning opportunities that ensure their success in the food and agricultural systems domain.

This program has supported the graduate training of approximately 1,342 students since 1984. The NNF beneficiaries have a reduced debt burden associated with their training. Today, more than 500 graduated USDA Fellows are making significant contributions in academia, federal and private-sector positions, professional organizations, and as USDA peer reviewers or recipients of competitive grants programs.

The fellowships are intended to encourage outstanding students to pursue and complete graduate degrees in critical areas of national need.

The contributions of three former Fellows, now in positions with the Agricultural Research Service (ARS), illustrate the importance of the NNF program:

- Colleen Cole Green is with the ARS Grassland Soil and Water Research Laboratory in Temple, TX. Green has received national and international recognition as an authority in the Soil and Water Assessment Tool (SWAT) model development. She has been with ARS for more than 3 years, including a post-doctoral assignment with the ARS at the National Soil Tilth Laboratory in Ames, IA. Green is having an impact on USDA conservation policy by assisting in the model development and application of Conservation Effects Assessment Project (CEAP) benchmark watershed assessments. She is also influencing Environmental Protection Agency environmental planning with the addition of phosphorus transport tools to the hydrologic model and is leading the development of a metals fate-and-transport routing submodel and its incorporation into the SWAT watershed model. Green has assisted in more than 10 SWAT-related workshops both domestically and internationally. She has been the primary author on 3 peer-reviewed journal publications, co-authored 3 peer-reviewed journal articles, and has 10 primary or secondary author journal publications in the review process. Green has cowritten two invited book chapters and is the primary author of three invited CSREES Best Management Practice factsheets. Green was a beneficiary of the fellowship grant at Colorado State University while she prepared for her doctoral degree.
- Gary Feyereisen is with the ARS Pasture Systems and Watershed Management Research Unit, University Park, PA. The NNF support allowed Feyereisen to research strategies to reduce nitrogen loss through artificial subsurface drainage systems from agricultural lands in Minnesota. Highlights of Feyereisen's doctoral work include the following:

— Feyereisen's research represented the College of Agriculture, Food, and Environmental Science at "Impress the President: A Student Exposition!" This event brought university and public community awareness to the type of research and public engagement projects that the University of Minnesota undergraduate, graduate, and professional students undertake;

— Feyereisen's work was presented at two international engineering conferences and was published in three scientific journals; and

— after graduate school, Feyereisen obtained an ARS postdoctoral post at the Southeast Watershed Research Laboratory in Tifton, GA, where he produced four journal articles and four proceedings manuscripts, and made four presentations at national meetings. He stimulated critical thought in several areas and was the catalyst for several new approaches for assessing uncertainty in USDA's CEAP.

— Feyereisen was a beneficiary of the fellowship grant at the University of Minnesota while he prepared for his doctoral degree.

- Harry Dawson is with the ARS Beltsville Human Nutrition Research Center, Beltsville, MD, where he conducts research exploring the role of nutrition in regulating the immune response in pigs as a model for humans. Dawson received a Ph.D. in Nutritional Sciences in 1998, was a postdoctoral fellow at the National Institutes of Health, National Institute on Aging in Baltimore for 3 years, and then accepted a position at the Beltsville Human Nutrition Research Center, where he is now a scientist. He has developed the Porcine Immunology and Nutrition Database as a resource for researchers involved in basic and applied research using pigs. Dawson produced three first-authored, peer-reviewed publications from his graduate work. Dawson was a beneficiary of the fellowship grant at Pennsylvania State University while he prepared for his doctoral degree.

The agency values suggestions and comments from the partnership about enhancing the training of students at the graduate level to meet the needs for a globally and scientifically competent workforce in the food and agricultural systems domain. For information, contact Audrey A. Trotman at 202-720-1973 or at NNF@csrees.usda.gov.

Higher Education: Past Success Shines Light on Bright Future

Many factors challenge academic programs to prepare future graduates in the food, agricultural, and natural resources sciences. Several important considerations include the racial and ethnic characteristics of K-12 students, student and family misconceptions about viable agricultural and natural resources career opportunities, and the changing skill sets employers require. In spite of these challenges, CSREES is optimistic about the future because of its successful record of accomplishment with previous and current programs.

The 1977 Farm Bill transferred agricultural higher education program authority to USDA from the Department of Education. In implementing this new authority, USDA established a number of teaching enhancement programs for land-grant universities and non-land-grant agricultural colleges, including:

- the National Needs Graduate Fellowships Program, established in 1984, to enhance scientific human capital development;
- the Higher Education Challenge Grants Program, established in 1990, to modernize food, agricultural, and natural resources curricula; instruction; student recruitment and retention; faculty development; and student experiential learning; and
- funding opportunities to address minority-serving institutions and increase the diversity of graduates entering the food and agricultural sciences workforce. These opportunities include the 1890 Institutions Teaching Capacity Building Grants Program; Multicultural Scholars Program; Alaska Native-Serving and Native Hawaiian-Serving Institutions Education Grants Program; Hispanic-Serving Institutions Education Grants Program; Tribal Colleges Education Equity Grants Program; and the Resident Instruction Program for Insular Area Colleges.

USDA now invests over \$50 million annually in higher education teaching programs through a dozen national initiatives that help food and agricultural sciences departments both within and outside the Land-Grant University System to enhance quality and build capacity. During the past quarter century, curricula have been transformed to challenge and serve students with broadening professional interests and academic backgrounds. Modernized facilities and equipment incorporate contemporary information systems and biotechnologies. Active learning and experiential education, including undergraduate research, internships in the

public and private sectors, and study abroad opportunities, receive increased emphasis. A focus on globalizing the curriculum strengthens the role our colleges and universities play in maintaining U.S. competitiveness. Outstanding students are attracted to graduate study in the food and agricultural sciences via graduate fellowships and there are now faculty recognition programs for outstanding teachers.

As the lead federal agency for higher education in the food and agricultural sciences, USDA has worked successfully with the nation's colleges and universities to transform programs of study and generate graduates with new and contemporary skills and attributes. In addition, there has been significant growth in the number of food and agricultural sciences bachelor's degree recipients over the past 20 years. In academic year 1985-86, colleges and universities awarded 30,670 bachelor's degrees in food, agriculture, family and consumer sciences, and natural resources disciplines, compared to 43,076 degrees in academic year 2004-05. (Source: U.S. Department of Education-NCES Table #254)

These successes illustrate USDA's commitment to providing agricultural higher education to the nation, and CSREES will continue to provide leadership within our partner academic and employer communities to acknowledge and resolve the challenges of the 21st century.

For more information, contact Jeff Gilmore, director of higher education programs, at jgilmore@csrees.usda.gov, or Greg Smith, national program leader in the Science and Education Resource Development Unit, at gsmith@csrees.usda.gov.

International Ag: Key to America's Future

"After speaking to producers here [in Denmark] I fully understand that farming is a hard business no matter where you are in the world. I have to commend my parents... on how they managed to keep a farm business growing through very hard times, and yet still be proud to produce food for the world. I truly know now how fortunate I am... and I will not soon forget that." – Jessica Hendrickson, senior in animal sciences at the University of Illinois, on returning to the United States from a trip to Denmark funded by CSREES' International Science and Education (ISE) competitive grants program.

Raising students' awareness about the world in which agriculture operates is just one of the facets of CSREES' international work. The broader agenda includes encouraging the globalization of all agricultural programs on campus-

es so that U.S. competitiveness is maintained and enhanced. For example, the ISE program facilitates research partnerships that help solve global problems such as the spread of animal diseases, drought, and food contamination—all challenges that face the United States and many other countries. ISE finds new overseas markets for our farm products. And, by building global awareness among extension professionals, our National Initiative to Internationalize Extension provides state and county agents with intercultural tools to serve the needs of diverse communities here at home. For many years, our National Research Initiative has sponsored markets and trade grants that support groundbreaking research on domestic and international opportunities and trends. In 2008, we and other government agencies will support the International Cooperative Biodiversity Groups to enhance sustainable plant and animal exploration that responds to agriculture, health, and energy needs.

"I have learned several important things that I think could benefit not only U.S. farmers, but the dairy industry as a whole—implications for dairy cattle health and cost management. I have learned to view things in a different light while being [in Denmark]. Thinking outside of the box is something I'm being taught how to do every day." – Alanna Kmicikewycz, junior in animal sciences at the University of Illinois, after returning from a CSREES-funded trip to Denmark.

CSREES also helps guide the U.S.-India Agricultural Knowledge Initiative (AKI) to jumpstart mutually beneficial partnerships between American and Indian agricultural universities and agribusinesses. With its focus on biotechnology, marketing, water management, and capacity development, the AKI involves more than 30 land-grant universities, and paves the way for a fresh, strategically important collaboration between two of the world's leading food-producing nations.

Stability in so many parts of the world is fragile. Prosperity and hope often directly depend on how well (or poorly) a country's agricultural sector performs. By providing assistance, CSREES helps strengthen the rural sector in a few key places around the world. One of our programs focuses on revitalizing Iraq's agricultural extension system, and a team of U.S. land-grant universities offers key training and advice to nearly 100 Iraqi extension and university specialists in horticulture, animal husbandry, water and soil management, and other critical areas.

Through a science and technology partnership, we also help researchers in Pakistan monitor and prevent animal disease outbreaks to improve production there—and protect our own farms here at home.

Our efforts are all about addressing critical needs today, and preparing the next generation for the world of tomorrow.

For more information, contact national program leaders Hiram Larew, at hlarew@csrees.usda.gov; Mike McGirr, at mmcgirr@csrees.usda.gov; Patty Fulton, at pfulton@csrees.usda.gov; Muquarrab Qureshi, at mqureshi@csrees.usda.gov; or Siva Sureshwaran, at ssureshwaran@csrees.usda.gov.

Advanced Engineering Systems a Must for Specialty Crop Industries

Specialty crop industries face a number of very serious production, processing, and marketing problems that threaten to severely damage this segment of U.S. agriculture. Defined as “fruits, vegetables, tree nuts, dried fruit, and nursery crops (including floriculture),” specialty crop industries must confront increased environmental pressure, rising labor costs, emergent insect and disease threats, and evolving consumer preferences. To address these concerns, individual industry segments have formed a research collective to examine common research needs. They found that they are united by a concern for the availability, skill level, and cost of labor—their single greatest production cost. But, that is only part of the story. These industries also need tools and technologies that can improve production efficiency, product quality, and post-harvest operations, and that can reduce their environmental footprint. They have agreed that they need automation, robotics, precision agriculture, sensors, and other advanced engineering systems to help their industries and its producers and processors become more efficient, productive, and sustainable.

Researchers and industry representatives have identified several engineering advances and technologies as critical to industry survival and success in the coming decades. These advances include improved and readily available sensors to increase knowledge of plant growing conditions and product quality; more efficient applications/use of water, nutrients, and chemicals; automated systems that can reduce costs of cultural practices; and better economic models and decision support systems that can improve production and management decisions. Some of these new technologies are urgently needed, while development of others needs to accelerate to ensure that advanced engineering systems will be available within the next decade.

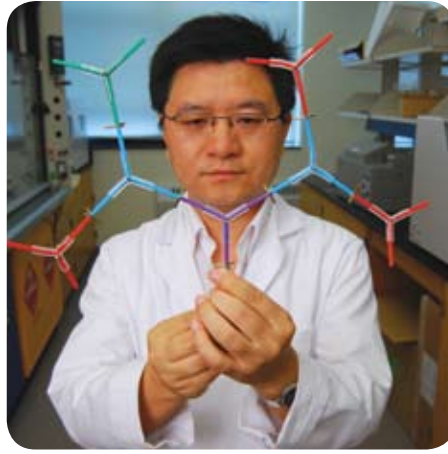
Greater sensor density in the production field, increased use of precision agriculture practices, and enhanced economic decisionmaking will drive production operations from the block (or row) down to the plant level. However, growers will not be able to operate at this level with existing management tools; the volume of data and number of possible decision alternatives will be overwhelming. This burgeoning data stream not only will demand new information technology tools, but will also require changes in workforce skills, with concomitant changes in educational program offerings.

While much research and development (R&D) needs to be done to provide technologies for the industries' long-term needs, many existing devices and capabilities remain uncommercialized. In general, the economies of scale are unfavorable in agriculture.

As production machinery of the future changes from mechanical to electro-mechanical systems, it makes sense (and may require) that new cropping architectures and new machines co-evolve simultaneously. This will help ensure that there is a good match between machine and plant capabilities, thereby increasing the efficiency of cultural operations.

While current labor issues provide much of the impetus for increased R&D investments, they are not the sole drivers. Product quality, characteristics, maturity, and traceability are high-priority industry concerns also. A changing labor force, the industries' environmental footprint, and new product markets and consumer expectations together will influence how specialty crop industries re-invent themselves in the coming decades.

Contact Daniel Schmoltdt, national program leader for the Plant and Animal Systems Unit, at dschmoltdt@csrees.usda.gov for more information.



Nanotechnology: Coming Up Large for 21st Century Agriculture

Nanoscale science, engineering, and technology have been, and continue to be, high priorities. CSREES has been praised as the leader and catalyst in introducing the new scientific frontier of nanoscience and nanotechnology into research and development (R&D) of agricultural and food systems. Since CSREES conducted the first national strategic planning workshop in November 2002, it has provided leadership and resources to facilitate research, education, and outreach through collaborations with diverse scientists and stakeholders, both domestically and internationally.

Programs such as the National Research Initiative (NRI), Integrated Food Safety, Small Business Innovation Research, and Higher Education Challenge Grants support many of the “nano” activities in research and education. The NRI program for Nanoscale Science and Engineering for Agriculture and Food Sciences, with an annual budget of \$2.5 million, has awarded grants to 27 projects through the FY 2004 to 2006 funding cycles. Some of these projects are conducting timely cutting-edge science that offers previously unattainable capabilities to effectively address critical agriculture and food issues.

Projects funded through FY 2004 and 2005 demonstrated the high relevance of nanoscience and nanotechnology to broad issues, such as improved efficiency of animal and plant production; enhanced food safety and agricultural

Above: (left) Cornell's Margaret Frey holds nanoscale fibrous mats with the potential to detect unsafe bacteria by a mere swipe of the cloth; (center) Cornell's Dan Luo studies nano-barcodes—cost-effective, early-warning detectors that expose harmful bacteria—to ensure a safer food supply; (right) University of Illinois' Graciela Padua holds flasks of Zein, a corn protein that provides micro-scaffolds—platforms for growing new skin or tiny frameworks built to deliver medicine to needy parts of the body.

biosecurity; improved food quality and human nutrition; environmental monitoring; bioenergy; and novel biobased and value-added products. Many of these projects contributed to improving detection of food pathogens and biohazards, including an investigation at Cornell University to incorporate nanobiosensors into interwoven fabrics. Other projects include the University of Illinois using zein, the prolamine of corn, as nanofabricated biomaterial for tissue scaffolding in the medical and veterinary treatment of wounded or failing tissues and organs; and the Vanderbilt University project to provide alternative, biobased energy resources by utilizing nanoscale components from green plants for solar energy conversion.

The tremendous potential of nanoscale science and nanotechnology to revolutionize agricultural and food systems has been clearly demonstrated through various programs supported by CSREES, as well as the R&D initiatives of the private sector and academia. Further evidence of this potential is seen in the increased interest and investment worldwide in advancing the new sciences for respective national economies. The U.S. National Nanotechnology Initiative will continue to serve as a central forum and resource to attract U.S. scientists of all disciplines to discover new sciences and utilize them for the benefits of society. A strategic partnership among the government, academia and private sector will potentially lead to quantum leaps in science and technology to revolutionize agriculture and food systems in the 21st century.

Contact Hongda Chen, national program leader on the Plant and Animal Systems Unit, at hchen@csrees.usda.gov for more information.