

Development and Commercialization of Biobased Materials Continue

USDA's Alternative Agricultural Research and Commercialization Board recently made initial selections of projects to be funded in fiscal 1995. USDA's Cooperative State Research, Education, and Extension Service is working with the U.S. Department of Defense to develop advanced materials from renewable resources. To date, USDA's Agricultural Research Service has negotiated over 425 cooperative research and development agreements with industrial partners. DOE's Alternative Feedstocks Program has developed a thermal/chemical clean fractionation process that is being evaluated by industry.

Updates: USDA's AARC Center

During fiscal 1993-94, USDA's Alternative Agricultural Research and Commercialization (AARC) Center used \$15.3 million to fund 39 projects. Private partners contributed another \$43 million, resulting in a private-public funding ratio approaching 3 to 1. The Center requires at least a 50-percent match in funds and negotiates a payback arrangement for each project. The Center received \$6.5 million in funding for fiscal 1995. The AARC Board met December 5-7, 1994, in Kansas City, MO, and made the initial round of 1995 project selections from approximately 100 applications.

In September 1994, Secretary of Agriculture Mike Espy announced a cooperative agreement between the AARC Center and the National Association of State Departments of Agriculture to provide outreach for the Center in all 50 states. Local entrepreneurs and other parties interested in the AARC Center program may now contact their local state department of agriculture for information. In addition, state officials can help identify and assist the Center with worthy projects.

The AARC Center completed its fiscal 1994 project funding by supporting two projects in Georgia and Texas. (See the June 1994 issue of this report for information on projects funded earlier this year.) The first project is with BioPlus, Inc., of Ashburn, GA. The company is using waste peanut hulls as a carrier for crop-protection compounds and, now, as cat litter. The hulls are run through a hammer mill and pelletized for the appropriate use. AARC Center funds are being used to develop and implement a marketing plan for the cat litter, which is 100-percent biodegradable, holds twice as much moisture as conventional clay litter, and is flushable.

The second project is with Indian Creek Mesquite of Brownwood, TX. The company is processing mesquite chips and marketing them as an environmentally friendly and taste-enhancing alternative to charcoal. The mesquite is coated with U.S. Food and Drug Administration-approved paraffin to help it burn, but contains no noxious hydrocarbons as does some charcoal. The product meets

stringent California clean air requirements. AARC Center funds are being used to upgrade the facility and develop a marketing program for the product. The company is using only larger mesquite trees, leaving the smaller ones for harvest in later years.

Most CSREES Programs Continue

Industrial use programs administered by USDA's Cooperative State Research, Education, and Extension Service (CSREES) were funded for fiscal 1995, with the exception of the high erucic acid development effort. (Under the Federal Crop Insurance Reform and Department of Agriculture Reorganization Act of 1994 [P.L. 103-354], the Cooperative State Research Service was merged with the Extension Service and renamed CSREES). The Advanced Materials from Renewable Resources Program, jointly administered by CSREES and the U.S. Army Natick Laboratory, was funded at \$5 million, the same as 1994. A portion of the funds is being utilized to test agricultural products in U.S. Department of Defense facilities. These tests include guayule rubber tires and biodiesel at the Army's proving grounds in Yuma, AZ, and spill adsorbents, solvents, cutting oils, peelable coatings, and packaging foams at the U.S. Army Tank and Automotive Research, Development, and Engineering Center in Warren, MI.

CSREES's industrial uses program recently displayed its accomplishments at two major technology exhibitions: Technology 2004, November 8-10, 1994, in Washington, DC, and the Biobased Products Expo '94, December 5-7, 1994, in Kansas City, MO. Vernonia, lesquerella, kenaf, and guayule were featured in the display.

ARS Marks a Decade of Formal Technology Transfer Activities

In 1984, USDA's Agricultural Research Service (ARS) published its first official technology transfer plan, which called for active interaction of agency scientists with industry to get ARS research results commercialized. Passage of the Federal Technology Transfer Act of 1986 gave the ARS technology-transfer program further

impetus. Under the act, ARS has negotiated over 425 Cooperative Research and Development Agreements (CRADA's) with industrial partners and pursued strong patenting and licensing efforts. ARS is among the top three or four Federal agencies in terms of the number of CRADA's signed.

During the first decade of its existence, the technology-transfer program facilitated the commercialization of at least a dozen new products from ARS research. These successes include low-calorie, high-fiber baking products from oat hulls, Oatrim (a fat substitute made from oat flour), biodegradable plastics from cornstarch, starch-based encapsulated pesticides, enzymatically assisted, peeled-and-sectioned citrus products, and lactose-free milk. End products containing these items account for hundreds of millions of dollars in sales annually. For example, Oatrim was incorporated into \$1 billion worth of "Healthy Choice" consumer products within 18 months of patent issue.

ARS signed 93 CRADA's in fiscal 1994, compared with 59 the previous year. An agreement with Franz Haas Machinery of Richmond, VA, is to develop biodegradable, water-resistant coating products made with 100-percent potato or cornstarch. As part of the CRADA, ARS scientists are evaluating several natural biodegradable polymers to make items such as foam cups, plates, and packaging that deter moisture absorption.

The agency filed 40 patent applications in fiscal 1994, down from 68 in 1993. An example of a 1994 application is a process to manufacture nonallergenic rubber latex from domestic plant species such as guayule, milkweed, and goldenrod (see the specialty plant products section for more information). Licensing of the technology is underway.

In fiscal 1995, ARS received \$79.5 million for research and development of new uses for agricultural commodities, the same as last year. Of this, \$45.3 million is allocated to new, nonfood uses and \$34.2 million to new foods and processing systems. A major benefit of the interactions facilitated by CRADA's and patent licenses is the feedback from industrial partners that helps the agency prioritize its research program to get the biggest bang for taxpayer dollars.

DOE's Alternative Feedstocks Program Reaches a Major Milestone

The U.S. Department of Energy's (DOE) Alternative Feedstocks Program (AFP), administered by the Office of Industrial Technologies, marked its first year and a half of research and development of technologies that convert renewable resources into chemicals. An objective of AFP is to demonstrate, through industrial partnerships, the commercial feasibility of biobased processes. Currently under development are two processes: One involves an organic acid (to demonstrate production of a high-volume intermediate chemical from a renewable resource), while the other uses lignocellulosic materials (to demonstrate an improved clean-fractionation-of-biomass technology).

The lignocellulosic project, which uses thermal/chemical clean fractionation, has reached a major milestone. DOE's National Renewable Energy Laboratory has demonstrated, on a laboratory scale, the ability of the process to produce cellulose and cellulose derivatives of interest to industry. This project has the potential to produce purer, less expensive cellulose and lignin fractions as starting materials for such products as:

- Cellulose for dissolving pulp;
- Cellulose esters used in coatings, thermoplastics, and textiles;
- Cellulose ethers used in latex paints, industrial thickeners, and food additives; and
- Lignin for quinones used in polymer intermediates, dyes, and pulping catalysts (see special article on pulping catalysts from lignin).

Industry is currently evaluating the laboratory samples, and the next step depends on their findings. Possible outcomes includes a collaborative partnership to further evaluate the derived products, a scale-up effort with an industrial partner, or both. A decision is expected soon after the first of the year. [Bob Armstrong, (202) 401-4860; Harry Parker, (806) 742-3553; William Tallent, (301) 504-6786; and Gloria Kulesa, (202) 586-8091]