

State and Federal Support for Cellulosic Ethanol Research & Development, Including Perennial Polyculture and Monoculture

KEC Staff Summary, August 2007

This summary was compiled by Kansas Energy Council (KEC) staff to help evaluate the need for additional State funding for research and development (R&D) of cellulosic ethanol.

Kansas: Possible Funding Sources

Kansas Bioscience Authority (KBA): Created by the Kansas Economic Growth Act (KEGA), the KBA focuses on providing R&D funding to government and private organizations investing in bioscience in Kansas. With approximately \$580 million over fifteen years, the KBA has provided funding for the Sunflower Bioenergy Integration Team and will soon offer assistance in acquiring Small Business Innovation Research (SBIR) grants. KBA administers the following core investment programs:

- **The Kansas Bioscience Research Matching Funds Program** matches federal, state, and private funding for research topics including ethanol and other biofuels. Created by KS Statute 74-99b84.
- **Kansas Bioscience Research and Development Voucher Program** provides incentives for bioscience companies or entrepreneurs to locate in Kansas by providing them with funds (referred to as “vouchers”) to undertake bioscience R&D activities with bioscience research institutions.
- **Bioscience Tax Investment Incentive Program** provides direct payments to bioscience companies of 50% of their Kansas net operating loss, up to \$1 million annually.
- **Bioscience Development Financing Program** allows the KBA to designate a Bioscience Development District, an area where the proceeds of property tax are used to pay for the cost of bioscience facilities built in the area.
- **Kansas Bioscience Scholar Program** is designed to encourage recruitment of an estimated 25 eminent scholars and 35 rising star scholars to advance the state’s bioscience research expertise.
- **Bioscience Research Facilities Program** funds construction and ongoing maintenance of bioscience research facilities. These facilities can be developed in collaboration with communities and universities.

<http://www.kansasbioauthority.org/investmentopps/index.html>

Kansas Technology Enterprise Corporation (KTEC): This private/public partnership was established by the State of Kansas to promote technology-based economic development. The Economic Development Initiative Fund provides KTEC’s state funding on a yearly basis, and KTEC leverages private sources to acquire funding. KTEC was a primary driver in passing KEGA and authorizing the KBA, and KTEC partners with the KBA in administering some programs. KTEC compiled and released the Kansas Bioscience & Innovation Roadmap, an outline suggesting future bioscience development for the state. One of the roadmap’s primary recommendations is the creation of the Kansas Center for Biologically Inspired Materials, a

facility focusing on research topics including biofuels. The primary research programs at KTEC are the Centers for Excellence Program, the Strategic Technology and Research (STAR) fund, and the Experimental Program to Stimulate Competitive Research (EPSCoR).

<http://www.kansasbio.org/info/roadmapster.pdf>

Agriculture Value Added Loan: This program, administered by the Department of Commerce, provides loans for feasibility studies up to 50% of the study cost. Loans are forgivable if study does not go forward, otherwise payback conditions exist.

<http://www.kansascommerce.com/Publications/ProgramDocuments.aspx?rscId=996847610272&rscName=Agricultural%20Value%20Added%20Center%20and%20Loan>

Kansas Academy of Science Student Research Grant Program: This program could be used to support the research endeavors of student members of the KAS or students whose major advisor is a member of the KAS. Research funds may be used to support investigation in any scientific field and in any locality. A maximum of three research grants (up to \$1000 each) for graduate students and a maximum of three research grants (up to \$500 each) for undergraduate students will be given each year. *Note: Although the monetary amounts of these grants are relatively small, they can be used to support students working at a program already possessing research funding.*

http://www.washburn.edu/kas/research_grant.html

Kansas State University Resources Providing Indirect Support of R&D

Advanced Manufacturing Institute (AMI): This program offers an array of resources to advance technologies and organizations through collaborative engineering and business partnerships. A full-service product and process development center is available to clients, who can take advantage of qualified labor supplied by full-time staff as well as engineering students in the process of receiving hands-on training. In a broad sense, AMI works to convert technologies and prototypes into commercial goods and marketable services. *Note: AMI could be consulted on new mechanical components necessary to collect, transport, and/or store cellulosic materials (crop residues or dedicated energy crops).*

<http://www.amisuccess.com/>

Bioprocessing and Industrial Value Added Program (BIVAP): This center specializes in the development of biomaterials processing technology for food, feed, and industrial uses and the utilization of agricultural-based materials to produce higher-value products for economic development. BIVAP assists agricultural-based companies in commercializing new technologies. There are 33,000 square feet of laboratories provided for work in extrusion, bioconversion/fermentation, biorefining, and thermal processing. *Note: BIVAP could provide lab assistance to determine the viability of dedicated energy crops or cellulosic biofuel.*

<http://www.grains.ksu.edu/BIVAP>

National Institute for Strategic Technology Acquisition and Commercialization (NISTAC):

This organization facilitates the acquisition and transfer of technologies into technologically-deficient regions. The underlying goal of NISTAC is also the commercial application of new technologies, and to that end NISTAC created a Mid-America Angel Investor Network of accredited investors to provide a source of early stage investment capital for startup companies. *Note: NISTAC could assist in locating angel investment funds for new technological acquisition and implementation related to cellulosic activity.*
<http://www.k-state.edu/tech.transfer/NISTAC>

Federal Government: Possible Funding Sources

The following programs provide either direct or indirect support for cellulosic ethanol R&D. Direct funding sources are grants directly targeting cellulosic ethanol research and development, while indirect sources include other types of assistance or programs that offer less direct support of cellulosic ethanol R&D. Most of the programs listed herein are administered by the U.S. Department of Agriculture (USDA). Grants supporting “agriculture” or “agricultural science” contain definitions including biofuel research. The USDA coordinates its ethanol and other biofuel efforts through the Biobased Products and Bioenergy Coordination Council (BBCC), which works to increase the amount of funding and cooperation available for biofuels research.¹ In addition, the Environmental Protection Agency (EPA) offers a grant to fund university research into biofuels and the Department of Energy’s (DOE) Biomass Program provides research and development support for biofuels and is especially interested in production of fuel from cellulose.

Programs included in this summary were found in either the Catalogue of Federal Domestic Assistance (CFDA) or the **Grants.gov** database. CFDA numbers and links to the appropriate database are provided for each program. KEC staff comments about the grants are italicized.

Direct Support of R&D

Demonstration of Integrated Biorefinery Operations for Producing Biofuels and Chemical/Materials Products: This grant provides funding to support the design and construction of small (1/10th commercial scale) cellulosic biorefineries in the U.S. Up to \$200 million in funding is available to support 5 to 10 small refineries. Applicants must cover at least half the cost of construction. This grant is administered by the DOE Office of Energy Efficiency and Renewable Energy.

http://www1.eere.energy.gov/biomass/biomass_solicitations.html

¹ The following USDA services oversee the grants in this summary: (1) Cooperative State Research Education and Extension Service (CSREES); (2) National Resources Conservation Service (NRCS); (3) Rural Business-Cooperative Service (RBCS) offers grants and funding to improve rural economies and promote innovation; (4) Economics Research Service (ERS) provides economic research services.

Biomass Research & Development Initiative: This program funds research and development of biomass-based products, bioenergy, biofuels, and related processes. Feedstock production, harvesting, and transport are specifically covered by this grant. Awards are capped at \$1 million and the total fund stands at \$18 million. The program operates on a yearly cycle and is jointly administered by the DOE and USDA. *Note: This grant covers any aspect of biofuel production as well as related biomass products. Potentially, grants from this program could research co-production of biofuel and other biomass based products from the separated components of the same feedstock. This fund is a top choice due to versatility, comprehensive nature, and level of funding.*

<http://www.grants.gov/search/search.do?oppId=14378&mode=VIEW>

<http://www.brdisolutions.com/default.aspx>

Fund for Rural America Research, Education, and Extension Activities: This program provides funds supporting research and extension projects to aid agricultural producers and rural communities in addressing changes and challenges resulting from fundamental reforms to Federal farm programs. Individual awards range between \$25,000 and \$600,000, with awards for planning Fund for Rural America centers averaging \$25,000 and standard implementation grants averaging \$271,000. No yearly net disbursement has been established; the fund is too new. Funded programs should conserve resources, develop new crops and crop uses, and increase economic opportunities in rural communities by expanding local processing. Acceptable use includes applied, developmental, and adaptive research; technology transfer; extension and related outreach activities; and education. Any college or university, public or private research facility, or other research facility with demonstrable research or implementation capacity may receive these grants. This grant is administered by the USDA CSREES. *Note: Not only does this program support cellulosic ethanol through funding research into new crop uses, it also supports expanded local processing, a potential economic outcome of cellulosic ethanol cropping. The expense of transporting low energy density cellulosic ethanol feedstock may favor local and discourage centralized processing. The stated intent to provide aid through fundamental reforms to Federal farm programs can be seen in light of increasing integration of and focus on biofuels in farm legislature. (CFDA Grant 10.224)*

Direct Support of Research Only

Energy for Sustainability: This program provides grants supporting research and education into energy production, conversion, and storage using environmentally friendly and renewable methods. Average annual award size is \$100,000. The primary focus of this grant fund is the production of hydrogen and alcohol for fuel uses, but biofuels are listed as a topic of study. This program is administered by the National Science Foundation (NSF). *Note: Although award size is relatively small, this grant specifically targets environmentally friendly and renewable energy production, which could include biofuels.*

<http://www.grants.gov/search/search.do?oppId=14832&mode=VIEW>

National Research Initiative Competitive Grants Program: This program provides grants to “address key problems of national, regional, and multi-state importance in sustaining all components of agriculture (farming, ranching, forestry including urban and agroforestry, aquaculture, rural communities, human nutrition, processing, etc.).” Biofuel/bioenergy research is specifically allowed. Grants are capped at \$1.5 million from a total award fund of \$181 million. Eligibility is mostly unrestricted. The USDA NRI provides this program.

http://www.csrees.usda.gov/funding/rfas/pdfs/07_nri.pdf

<http://www.grants.gov/search/search.do?oppId=10950&mode=VIEW>

Grants for Agricultural Research, Special Research Grants: This program provides project grants for research “promising breakthroughs in areas of the food and agricultural sciences of importance to the nation.” Individual awards range from \$56,664 to \$9,549,325, with the average award size at \$1.8 million.² Net yearly expenditures for 2007 are estimated at \$17 million, but yearly funding levels for 2006 and 2007 were around \$130 million. Research areas are supposed to be “high priority problems of a regional or national scope.” Eligibility is mostly unrestricted. These grants are offered through USDA CSREES. *Note: Cellulosic ethanol production relates to energy security and sustainability, two issues of major national concern.* (CFDA Grant 10.200)

Payments to Agricultural Experiment Stations Under the Hatch Act: These grants support agricultural research at State Agricultural Experiment Stations that promotes “production, marketing, distribution, and utilization of products of the farm as essential to the health and welfare of people.” Awards range from \$611,608 to \$5,831,557, with an average of \$2,796,141 and yearly total expenditures are around \$170 millions. Applicants must be State Agricultural Experiment Stations, fund use is mostly discretionary. These grants are offered through USDA CSREES. *Note: This grant is well funded and could be used to research aspects of feedstock production.* (CFDA Grant 10.203)

Office of Science Financial Assistance Program: This program offers project grants for “fundamental research in the basic sciences and advanced technology concepts and assessments in fields related to energy.” Awards range from \$10,000 to \$2,000,000, averaging \$200,000. Net yearly award disbursement is \$830,000. Fund use is largely unrestricted, although stipulations can be tailored to individual grants. Eligible entities include colleges and universities, nonprofit organizations, for-profit commercial organizations, state and local governments, and unaffiliated individuals. This program is offered through the DOE Office of Science. *Note: Although this grant does not specifically target biofuels, it can be assumed that cellulosic ethanol is supported due to the position of biofuels as an energy research sub-category and the DOE’s focus on biofuels.* (CFDA Grant 81.049)

² The average was computed from the complete list of recipients and was not taken from the CFDA page. The CFDA average given for this program is below the minimum award amount, which is impossible and must be an error.

Sustainable Agriculture Research and Education: This program offers grants for, among other uses, projects that study various kinds of agricultural production systems in varying climates. Individual awards have ranged from \$8,000 to \$1,752,250, averaging \$855,540. Yearly fund disbursement has been between \$8 and \$12 million for the past three years. Once new techniques have been sufficiently researched and proven, grant funds may be used to disseminate new methods to farmers. Colleges and universities, state agricultural experiment stations, state cooperative extension services, nonprofit organizations, Federal or State entities, and “individuals with demonstrable experience” all qualify for these grants. This program is offered through the USDA CSREES. *Note: As a “major catalyst and facilitator of alternative agricultural systems for the future,” this program should encompass feedstock production research and has a large average award size.* (CFDA Grant 10.215)

Biological Sciences: This program provides project grants to perform research that progresses the biological sciences and increases scientific knowledge while addressing major problems confronting the nation. Individual awards range between \$2,000 and \$12,389,000, averaging \$184,040. Net fund disbursement is around \$600,000. Grant funds may be used to purchase equipment, pay salaries, pay travel costs, publish material, and for any other necessity in the course of conducting a research project. Eligible institutions are public and private colleges and universities, nonprofit non-academic organizations, state/local governments, and special circumstance unaffiliated scientists. The National Science Foundation (NSF) administers this program. *Note: Although this grant does not specifically mention cellulosic ethanol R&D, the scope of the grant is broad and cellulosic ethanol production relates to energy security and sustainability, two “major problems confronting the nation.”* (CFDA Grant 47.074)

Surveys, Studies, Investigations and Special Purpose Grants within the Office of Research and Development: This program offers project grants to, among other goals, fund regional research addressing sustainability at the local, state, and industrial levels. Individual awards range between \$5,000 and \$500,000, averaging \$100,000. Net yearly funding is \$6.7 million. Fund usage is generally limited to direct costs. Eligible agencies are public and private universities and colleges, hospitals, laboratories, state and local government departments, other public or private nonprofit institutions, and, in some cases, individuals who have demonstrated unusually high scientific ability. This program is administered by the EPA Office of Research and Development. *Note: Cellulosic ethanol R&D addresses sustainability and is a regional issue.* (CFDA Grant 66.510)

Integrated Programs: This program offers project grants for agricultural research, extension, and education activities addressing priorities in U.S. agriculture. Individual awards range between \$20,000 and \$2,080,000, averaging \$499,050. Net yearly disbursement is estimated at only \$3.5 million in 2007, a sharp decline from levels between \$41 and \$42 million in 2005 and 2006. Eligible parties are state agricultural experiment stations, state cooperative extension services, all colleges and universities, other research and extension institutions and organizations, Federal agencies, private organizations or corporations, and qualified individuals. This grant is offered through USDA CSREES. *Note: Although this program does not exclusively focus on*

cellulosic ethanol production, it certainly includes such research in its intent to address priorities in agriculture. Sustainability is both a high agricultural priority and an important component of cellulosic ethanol crop system proposals. This program is ranked highly due to a combination of funding levels and potential applicability. (CFDA Grant 10.303)

1994 Institutions Research Program: These grants are awarded for the purpose of high priority research. Individual awards range from \$40,963 to \$150,000, averaging \$66,221. Yearly net fund disbursement is around \$1 million. Grants are available to the 30 institutions designated as 1994 institutions, including Haskell University. This program is offered through the USDA CSREES. *Note: Cellulosic ethanol research is considered high priority in ethanol producing regions. This grant has relatively low funding and only covers cellulosic ethanol research as part of an umbrella definition. (CFDA Grant 10.227)*

Direct Support of Development Only

Business and Industry Loans: This program provides grants for developing or improving the economic and environmental climate in rural communities through the creation of new business and industry methods. Individual awards range between \$35,000 and \$17.5 million, averaging \$2 million. Net yearly program expenditures have increased from around \$700 million in 2005 to \$1 billion in 2007. An applicant may be a cooperative, corporation, partnership, trust, or other legal entity organized and operated on a profit or nonprofit basis; an Indian tribe; a municipality, county, or other political subdivision of a State; or individuals in rural areas. This program is administered by the USDA Rural Business-Cooperative Service (RBCS). *Note: Although this grant does not specifically target any kind of biofuel production, it seems reasonable that such a large and newly emergent industry would be covered. (CFDA Grant 10.768)*

Small Business Innovation Research Grant: These grants are intended to assist small businesses (having 500 employees or less) in discovering innovative new methods. Individual awards are capped at \$100,000. Applying businesses must demonstrate strong science and engineering research capabilities. This program is administered by the DOE.
<http://www.grants.gov/search/search.do?oppId=10660&mode=VIEW>
<http://www.science.doe.gov/sbir/NEWWEB/Introduction.htm>

Indirect Support of R&D

The programs listed below have potential to indirectly support (financially or otherwise) cellulosic ethanol R&D.

Rangeland Research: This program is intended to contribute to the improvement of U.S. rangeland resources and the ecosystem services they provide by supporting the development of new and emerging rangeland science methodologies. The primary purpose of RRP is to provide U.S. agricultural producers, rural landowners, and land managers with integrated science strategies to make informed land-management decisions with an emphasis on enhancing the

restoration and sustainable integrity of rangelands. Individual rewards fall between \$350,000 and \$500,000 out of a total of \$1.25 million. This program is renewed yearly. *Note: The presumed connection to cellulosic ethanol is sustainability; harvesting of rangeland perennials instead of traditional crops is one possible mode of cellulosic ethanol feedstock acquisition.*
<http://www.grants.gov/search/search.do?oppId=14345&mode=VIEW>

Agriculture on Indian Lands: This program offers specific use direct payments, advisory counseling, and other services to improve Indian trust or restricted fee lands. Individual payments range between \$200 and \$575,000, averaging \$50,000. Net fund disbursement averages \$3.4 million. Applicants must be federally recognized Indian Tribal Governments and Native American Organizations authorized by such governments. This program is administered by the Department of the Interior Bureau of Indian Affairs. *Note: The development stages of cellulosic ethanol feedstock cropping methods might benefit from this program if such agriculture counts as an improvement to the land.*
(CFDA Grant 15.034)

Environmental Quality Incentives Program: This program offers direct payments for specific uses addressing natural resource concerns on farmlands in an environmentally friendly and cost effective manner. Direct payments are limited to \$10,000 per year per person with a lifetime cap of \$50,000. Average payouts are estimated at \$15,000. Net yearly award expenditures hover around \$750 million. Applicants may be “agricultural producers who face serious threats to soil, water, and related natural resources.” This program is administered by the USDA NRCS. *Note: Because production of some cellulosic ethanol feedstock crops can be viewed as environmentally friendly, this grant could fund early development of cellulosic ethanol feedstock cropping systems.* (CFDA Grant 10.912)

Soil Survey: This program disseminates soil survey information to “planners, environmentalists, engineers, zoning commissions, tax commissions, homeowners, farmers, ranchers, developers, landowners, and operators.” Total yearly funding has risen from \$88 and \$89 million between 2005 and 2007. The program is run by the USDA NRCS. *Note: This service could be useful in determining sites for feedstock production and estimating the possible extent of land utilization.*
(CFDA Grant 10.903)

Agricultural and Rural Economic Research: This program performs economic research and analysis related to U.S. and world agriculture. Funding levels were about \$84 million in 2007. This program is administered through the USDA Economics Research Service (ERS). *Note: Information available from the ERS might be useful in developing cellulosic ethanol cropping methods.* (CFDA Grant 10.250)

National Agricultural Library: This program offers access to library and database type repositories focusing on agriculture. Information is freely available to the government, public,

and private sectors. This USDA program requires about \$25 million a year in funding. *Note: Available information could potentially assist in cellulosic ethanol R&D, and this service could eventually be used to disseminate information on proven methodologies.*

Resource Conservation and Development: This program offers advisory services and counseling to “encourage and improve the capability of State and local units of government and local nonprofit organizations in rural areas to plan, develop and carry out programs for resource conservation and development.” Eligible entities are “state and local governments and nonprofit organizations with authority to plan or carry out activities relating to resource use and development in multi-jurisdictional areas.” Total yearly funding was around \$50 million in 2005 and 2006 but is only projected to reach about \$26 million in 2007. This program is offered through the USDA NRCS. *Note: The potential sustainability of some cellulosic ethanol feedstocks might fit the intent of this program.* (CFDA Grant 10.901)

Plant Materials for Conservation: This program provides specialized services to promote the commercial use of new or improved plant materials for conservation and environmental improvement programs. Eligible entities are government or private interests involved in agriculture and conservation. Funding for this USDA NRCS program has fallen from \$13 million to \$11 million between 2005 and 2007. *Note: The connection here is between the grant’s intent to promote sustainability and the potential for sustainability in cellulosic ethanol production.* (CFDA Grant 10.905)