



Federal Register

**Monday,
March 6, 2000**

Part II

Department of Agriculture

**Cooperative State Research, Education,
and Extension Service**

**Request for Proposals (RFP): Initiative for
Future Agriculture and Food Systems, FY
2000; Notice**

DEPARTMENT OF AGRICULTURE**Cooperative State Research,
Education, and Extension Service****Request for Proposals (RFP): Initiative
for Future Agriculture and Food
Systems, FY 2000****AGENCY:** Cooperative State Research,
Education and Extension Service**ACTION:** Notice of Request for Proposals
and Request for Input

SUMMARY: The Cooperative State Research, Education, and Extension Service (CSREES) announces the availability of grant funds and requests proposals for the Initiative for Future Agriculture and Food Systems Program (IFAFS) for fiscal year (FY) 2000 to support competitively awarded research, extension and education grants addressing key issues of national and regional importance to agriculture, forestry, and related topics. The amount available for support of this program in FY 2000 is approximately \$113,400,000.

This notice sets out the objectives for these projects, the eligibility criteria for projects and applicants, the application procedures, and the set of instructions needed to apply for an IFAFS grant under this authority.

By this notice, CSREES additionally solicits stakeholder input from any interested party regarding the FY 2000 IFAFS for use in development of any future requests for proposals for this program.

DATES: Proposals must be transmitted by May 8, 2000, as indicated by postmark or date on courier bill of lading. Proposals transmitted after this date will not be considered for funding. Comments regarding this request for proposals are requested within six months from the issuance of this notice. Comments received after that date will be considered to the extent practicable.

ADDRESSES: The address for hand-delivered proposals or proposals submitted using an express mail or overnight courier service is: Initiative for Future Agriculture and Food Systems; c/o Proposal Services Unit; Cooperative State Research, Education, and Extension Service; U.S. Department of Agriculture; Room 303, Aerospace Center; 901 D Street, S.W.; Washington, D.C. 20024.

Proposals sent via the U.S. Postal Service must be sent to the following address: Initiative for Future Agriculture and Food Systems; c/o Proposal Services Unit; Cooperative State Research, Education, and Extension Service; U.S. Department of Agriculture; STOP 2245; 1400 Independence

Avenue, S.W.; Washington, D.C. 20250-2245.

Written user comments should be submitted by first-class mail to: Policy and Program Liaison Staff; Office of Extramural Programs; USDA-CSREES; STOP 2299; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-2299; or via e-mail to: RFP-OEP@reeusda.gov. In your comments, please include the name of the program and the fiscal year of the RFP to which you are responding.

FOR FURTHER INFORMATION: Applicants and other interested parties are encouraged to contact the Program Director listed in the program areas found in the Program Area Description section below; or Dr. Rodney Foil, Director IFAFS, Cooperative State Research, Education, and Extension Service; U.S. Department of Agriculture; STOP 2242; 1400 Independence Avenue, S.W. Washington, D.C. 20250-2242; telephone: (202) 401-5022; email: rfoil@reeusda.gov; or Dr. Cynthia Huebner, Assistant Director IFAFS, at the same address; telephone: (202) 401-4114; email: chuebner@reeusda.gov.

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Stakeholder Input

CSREES is soliciting comments regarding this solicitation of applications from any interested party. These comments will be considered in the development of any future RFP for the program. Such comments will be

forwarded to the Secretary or his designee for use in meeting the requirements of section 103(c)(2) of the Agricultural Research, Extension, and Education Reform Act of 1998 (7 U.S.C. 7613(c)(2)). This section requires the Secretary to solicit and consider input on a current RFP from persons who conduct or use agricultural research, education and extension for use in formulating future RFPs for competitive programs. Comments should be submitted as provided for in the **ADDRESSES** and **DATES** portions of this Notice.

Catalog of Federal Domestic Assistance

This program is listed in the Catalog of Federal Domestic Assistance under 10.302, Initiative for Future Agriculture and Food Systems.

Part I—General Information*A. Legislative Authority and Background*

Section 401 of the Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA) (7 U.S.C. 7621) established in the Treasury of the United States an IFAFS account and authorized the Secretary of Agriculture to establish a research, extension, and education competitive grants program to address critical emerging agricultural issues related to (1) future food production, (2) environmental quality and natural resource management, or (3) farm income. Grants are to be awarded that shall address priority mission areas related (a) Agricultural genome, (b) Food safety, food technology and human nutrition, (c) New and alternative uses and production of agricultural commodities and products, (d) Agricultural biotechnology, (e) Natural resource management, including precision agriculture, and (f) Farm efficiency and profitability, including the viability and competitiveness of small- and medium-sized dairy, livestock, crop, and other commodity operations. Priority is to be given to projects that are multistate, multi-institutional, or multidisciplinary or projects that integrate agricultural research, extension and education.

Subject to the availability of funds to carry out this program, the Secretary may award grants to Federal research agencies, national laboratories, colleges and universities or research foundations maintained by a college or university, or a private research organization with an established and demonstrated capacity to perform research or technology transfer. Grants also may be awarded to ensure that faculty of small and mid-sized institutions that have not

previously been successful in obtaining competitive grants under subsection (b) of the Competitive, Special, and Facilities Research Grant Act (7 U.S.C. 450i(b)) (*i.e.*, the CSREES National Research Initiative Competitive Grants Program) receive a portion of the IFAFS grants. Grants are to be awarded to address priorities in United States agriculture that involve research, extension, and education activities as determined by the Secretary in consultation with the National Agricultural Research, Extension, Education, and Economics Advisory Board; and stakeholders through a public meeting held in July of 1998.

B. Purpose, Priorities and Fund Availability

The purpose of the IFAFS is to support research, education and extension grants that address critical emerging agricultural issues related to (1) future food production, (2) environmental quality and natural resource management, or (3) farm income.

In awarding IFAFS grants, priority will be given to projects that are multistate, multi-institutional, or multidisciplinary or projects that integrate agricultural research, extension and education. Integrated projects hold the greatest potential to produce and transfer knowledge directly to end users, while providing for educational opportunities to assure agricultural expertise in future generations. The IFAFS also holds great opportunity to bring the agricultural knowledge system to bear on issues impacting small and mid-sized producers and land managers, thus enabling improvements in quality of life and community. In support of the agency's goal to enhance the competitiveness of U.S. agriculture, consideration will also be given to projects (with U.S. institutions as the lead) that incorporate an international dimension with demonstrable domestic benefits.

IFAFS is distinct from other CSREES programs because of its priority on integration of research, extension, and education; its consideration of the concerns of small and mid-sized operations; its emphasis of agricultural production issues; and its goal to support relatively large projects that provide more intensive support to the research, extension, and education system.

There is no commitment by USDA to fund any particular proposal or to make a specific number of awards. Approximately \$113,400,000 is available in FY 2000 for programs

within the IFAFS for the following priority areas: Agriculture Genome and Agricultural Biotechnology (\$32,800,000); Food Safety, Food Technology, and Human Nutrition (\$23,600,000); New and Alternative Uses and Production of Agricultural Commodities and Products (\$9,400,000); Natural Resource Management, including Precision Agriculture (\$28,400,000); and Farm Efficiency and Profitability, Including the Viability and Competitiveness of Small-and Medium-sized Dairy, Livestock, Crop, and Other Commodity Operations (\$18,900,000). Funds available for each priority area are targets. The number and quality of applications, as well as the need to reach programmatic goals, may necessitate the movement of funds between priority areas.

Funds will be made available to small or mid-sized academic institutions that have not been previously successful in obtaining competitive grants under the National Research Initiative Competitive Grants Research Program.

The program areas described herein were developed within the context of the authorized purposes of both USDA research, extension, and education (7 U.S.C. 3101) and IFAFS (7 U.S.C. 401), within the framework of the CSREES Strategic Plan (Available at www.usda.gov/ocfo/strat/ree.pdf) and based on stakeholder input.

C. Definitions

For the purpose of awarding grants under this program, the following definitions are applicable:

(1) *Administrator* means the Administrator of the Cooperative State Research, Education, and Extension Service (CSREES) and any other officer or employee of the Department to whom the authority involved may be delegated.

(2) *Authorized departmental officer* means the Secretary or any employee of the Department who has the authority to issue or modify grant instruments on behalf of the Secretary.

(3) *Authorized organizational representative* means the president or chief executive officer of the applicant organization or the official, designated by the president or chief executive officer of the applicant organization, who has the authority to commit the resources of the organization.

(4) *Budget period* means the interval of time (usually 12 months) into which the project period is divided for budgetary and reporting purposes.

(5) *Cash contributions* means the applicant's cash outlay, including the outlay of money contributed to the applicant by non-Federal third parties.

(6) *Department or USDA* means the United States Department of Agriculture.

(7) *Education activity* means an act or process that imparts knowledge or skills through formal or informal schooling.

(8) *Extension activity* means an act or process that delivers research-based knowledge and educational programs to people, enabling them to make practical decisions.

(9) *Grant* means the award by the Secretary of funds to an eligible organization or individual to assist in meeting the costs of conducting, for the benefit of the public, an identified project which is intended and designed to accomplish the purpose of the program as identified in these guidelines.

(10) *Grantee* means the organization designated in the grant award document as the responsible legal entity to which a grant is awarded.

(11) *Integrated* means to bring together the three components of the agricultural knowledge system (research, education and extension) together around a problem area or activity.

(12) *Matching* means that portion of allowable project costs not borne by the Federal Government, including the value of in-kind contributions.

(13) *National laboratories* include Federal laboratories that are government-owned contractor-operated or government-owned government-operated.

(14) *Peer review* is an evaluation of a proposed project for scientific or technical quality and relevance performed by experts with the scientific knowledge and technical skills to conduct the proposed work or to give expert advice on the merits of a proposal.

(15) *Principal Investigator/Project director* means the single individual designated by the grantee in the grant application and approved by the Secretary who is responsible for the direction and management of the project.

(16) *Prior approval* means written approval evidencing prior consent by an authorized departmental officer as defined in (2) above.

(17) *Private research organization with an established and demonstrated capacity to perform research or technology transfer* means any non-governmental corporation, partnership, proprietorship, trust, or other organization that (1) conducts any systematic study directed toward new or fuller knowledge and understanding of the subject studied, or (2) systematically relates or applies the findings of

research or scientific experimentation to the application of new approaches to problem solving, technologies, or management practices; and (3) has facilities, qualified personnel, independent funding, and prior projects and accomplishments in research or technology transfer.

(18) *Project* means the particular activity within the scope of the program supported by a grant award.

(19) *Project period* means the period, as stated in the award document and modifications thereto, if any, during which Federal sponsorship begins and ends.

(20) *Research activity* means a scientific investigation or inquiry that results in the generation of knowledge.

(21) *Secretary* means the Secretary of Agriculture and any other officer or employee of the Department to whom the authority involved may be delegated.

(22) *Small and Mid-Sized Institutions* means academic institutions having an enrollment of 15,000 or fewer (including part-time students), and that are no higher than the 50th percentile of academic institutions funded by the National Research Initiative Competitive Grants Program in the past three years and are not within the top 100 Federally funded institutions. (See Appendix A.)

(23) *Third party in-kind contributions* means non-cash contributions of property or services provided by non-Federal third parties, including real property, equipment, supplies and other expendable property, directly benefitting and specifically identifiable to a funded project or program.

D. Eligibility

Proposals may be submitted by Federal research agencies, national laboratories, colleges or universities or research foundations maintained by a college or university, or private research organization with an established and demonstrated capacity to perform research or technology transfer. Eligible applicants may subcontract to organizations not eligible under these requirements.

E. Matching Requirements

If a grant provides for applied research that is commodity specific and not of national scope, the grant recipient is required to provide funds or in-kind support to match the amount of Federal grant funds provided.

F. Restrictions on Use of Funds

1. Funds for Buildings and Facilities

IFAFS funds may not be used for the renovation or refurbishment of research

spaces; the purchase or installation of fixed equipment in such spaces; or the planning, repair, rehabilitation, acquisition, or construction of buildings or facilities.

2. Funds for Human Cloning

In accordance with the President's Memorandum of March 4, 1997, regarding the use of Federal funds for the cloning of human beings (33 Weekly Comp. Pres. Doc. 278), IFAFS funds shall not be used to support, fund, or undertake any cloning activity that could lead to the creation of a new human being with genetic material identical to that of another human being, including research related directly thereto. The prohibition on use of grant funds to "support" human cloning activity includes using, or making available for use, grant-funded equipment for use in connection with human cloning. This ban does not restrict research into the cloning of plants, animals, or individual human cells that cannot develop into a new human being.

Part II—Program Description

A. Types of Projects to be Supported

1. Consortia

Dependent on the merits of proposals received, no less than thirty percent of the total available IFAFS funds will be used for support of consortia. Consortia are entities that may involve multiple states and/or institutions that conduct research; synthesize previous, ongoing and future research; develop curricula and build educational and research capacity; and transfer information to producers, end users, and the public. All IFAFS consortia will be expected to address the needs of agricultural research, extension and education that cannot be addressed through the funding of separate efforts. It is the intent of CSREES to promote collaboration, open communication, exchange of information and resources, and integration of activities among individuals, institutions, states or regions. Consortia should minimize isolation and over-competitiveness, reduce duplication of efforts, and provide an accessible source of expert information, technology, and education upon which the public can draw.

Consortia may be organized around a particular topic or they can be geographically based. Geographically-defined consortia applicants must address the interaction of the problems most relevant to a particular region using a systems-oriented, landscape-scale approach. In contrast, topic-based consortia should focus on a single issue

(e.g., minority land ownership or functional foods) that may be of nationwide or regional interest. For either consortium type, an explanation also must be provided for why such an entity has more potential for success than several smaller grants. Requested funds for individual consortia proposals can range between \$1–5 million for the total duration of four years. CSREES expects that relatively few grants will be supported at the higher end of this range. The amount requested must be commensurate with the activities proposed.

A designated lead institution of each consortium will administer funds and be responsible for overall management of activities. The proposal must include how the administration of the grant within the consortium will be achieved and monitored. Plans for how each consortium will be maintained and monitored for progress during and beyond the duration of the grant should also be included in the proposal. Consortia proposals will be evaluated on both administrative and monitoring procedures as well as on the merit and likelihood of success of the overall project.

2. Standard

Dependent on the merits of proposals received, no less than thirty percent of the total available funds will be used for standard grants. Standard projects are expected to address research, extension and education in a focused project. Requested funds for individual standard proposals cannot exceed a total request of \$1 million for a duration of four years. The amount requested must be commensurate with the activities proposed; support for very large requests of funds will be highly competitive. Standard projects will be encouraged to coordinate with IFAFS-funded consortia pertinent to their project focus.

Dependent on the merits of proposals received, CSREES will ensure that a portion of either consortia or standard grants will be awarded to proposals in which the lead institution (recipient of the Federal funds) is a small- or mid-sized institution (as defined in Part I, C. Definitions). Other institutions or organizations involved in small- and mid-sized institution eligible projects need not meet the criteria described in the definition of a small and mid-sized institution.

B. Program Area Description

1. Agricultural Genomics (Program Area 10.0)

The IFAFS seeks to sponsor integrated research, education and extension programs in plant, animal and microbe genomics and the development of bioinformatic tools with specific applications to agricultural challenges.

A more complete understanding of the entire complement of genes in agriculturally relevant plants, animals and microbes is imperative. More knowledge in this area will have a major impact on the ability of the United States to produce nutritious and safe food, while preserving the environment and sustaining the economic stability of the agricultural enterprise. Greater efforts aimed at identifying, mapping and understanding the function and control of genes responsible for economically important traits in agriculturally important species of plants, animals and microbes are needed. Such efforts will lead to the development of new genetic technologies for improvements in yield, pest and pathogen resistance, and the composition, quality, and safety of U.S. agricultural products.

New bioinformatic and computational biology tools are needed to analyze, interpret and utilize the vast amounts of data that will be generated by genomic research in agriculturally important species. CSREES expects that bioinformatics will be an integral component of any project funded under this Agricultural Genomics program. CSREES is also interested in funding integrated projects primarily dedicated to the research and development of bioinformatics tools and education programs, hence a separate sub-area in bioinformatics. Prospective applicants who are primarily interested in working on a particular plant, animal or microbial system should address their projects to the relevant section. Those primarily interested in developing bioinformatics tools, software, and training programs should address their proposal to the sub-area on Bioinformatics.

All agricultural genomics grant recipients are strongly encouraged to attend or present at an annual grantee workshop that will occur at a date and time to be determined.

Investigators are expected to explain clearly how the ownership of information and research materials and their public release will be handled. Rapid and unrestricted sharing of genomic sequence data is essential for advancing research on agriculturally important species. Early release of

unfinished sequence has already proven useful in accelerating the pace of experimental discovery in non-agricultural fields, such as human health, energy production and bioremediation. At the same time, CSREES recognizes that it also is necessary to allow investigators time to verify the accuracy of their data and to accomplish the goals proposed in their application, which often includes the assembly and annotation of the sequence data.

In addition to the general data release procedures above, applications for support of genome sequencing projects must include a detailed description of the data release plan. Timely release is strongly encouraged in recognition of the benefits to the broader research community. Release should be accompanied by appropriate information on the reliability of the data (e.g., level of coverage and extent of assembly, extent of contamination with vector and other sequences, statistical measures of accuracy). At a minimum, it is anticipated that sequence data will be released within one month after 3X coverage of the genome (or chromosome for eukaryotic organisms) is achieved. The released data should be provided as assemblies of equal to, or greater than, one kilobase contigs. Subsequent releases of assembled sequences should be provided at least on a monthly basis.

In the view of some, raw genomic sequences, in the absence of additional demonstrated biological information, lack demonstrated utility and therefore are inappropriate for patent filing. Patent applications on large blocks of primary genomic sequence could stifle future research and the development of future inventions of useful products. However, according to the Bayh-Dole Act, the grantees have the right to elect to retain title to subject inventions and are free to choose to apply for patents should additional biological experiments reveal convincing evidence of utility. CSREES grantees are reminded that the grantee institution is required to disclose each subject invention to CSREES within two months after the inventor discloses it in writing to grantee institution personnel responsible for patent matters.

10.1 Plant Genome. (For clarification on this sub-area, contact the Program Director, Liang-Shiou Lin, at 202-401-5042, e-mail: llin@reeusda.gov or Gail Mclean, at 202-401-6060, e-mail: gmclean@reeusda.gov.)

Research in plant genomics has advanced rapidly in the past few years, and the entire genomic sequences of Arabidopsis and rice will be determined and annotated in the near future.

Knowledge of these sequences will provide basic information on the genes in a flowering plant species. While genomic tools and resources are currently available for plant research, they will need to be improved and expanded. Additionally, genomic resources will need to be developed for other economically important plant species. Furthermore, if genomic information is to be applied to plant improvement, more research is needed to determine the function of gene sequences.

The IFAFS Plant Genome Program sub-area will support projects that advance our knowledge of the structure, organization and function of agriculturally important plant genomes. The investment in plant genomics will expand the efforts of the National Plant Genome Initiative (NPGI) coordinated under the National Science and Technology Committee (NSTC) Plant Genome Program. Participating research agencies of the NSTC effort include USDA, the Department of Energy (DOE), the National Institutes of Health (NIH), and the National Science Foundation (NSF).

Examples of education and extension components pertinent to this sub-area include training of graduate and undergraduate students, postdoctoral associates, and/or colleagues (through classes, seminars, workshops, sabbaticals) in the use of genomic resources or outreach to the community through informational seminars and classes on the benefits and methods of genomic research. Wherever appropriate, investigators are encouraged to develop national and international collaborations with research groups already working on the species of interest to maximize the use of structural and functional genomic resources. Collaborations with private industry that have made a significant investment in the species are also encouraged to avoid unnecessary duplication of effort.

Proposals must address one of the two specific topic areas below:

(a) *Development of genomic tools and resources for plant species important to agriculture or forestry.* Collaborative large-scale structural genomics projects are now underway for plants of national and international interest including barley, canola, corn, cotton, lettuce, loblolly pine, peach, potato, poplar, rice, sorghum, soybean, sunflower, tomato, and wheat. Some of these projects have already provided or will soon provide the agricultural research community with genetic and physical maps, ESTs, libraries, and mutant populations. In contrast, genomic tools

and resources for most horticultural crops and forest tree species have not been developed to a comparable extent. Thus, high throughput genomic approaches to understand genome structure and organization of economically important horticultural, (including fruit and vegetable crop species and ornamental plants relevant to U.S. agriculture), and forest plants, will be given high priority, particularly those plants that have not been the focus of major study. However, proposals that extend or complement ongoing research on agricultural plants already under study will be considered; potential research areas include characterization of gene-rich regions of complex cereal genomes, synteny of cereal genomes with rice, and mapping and sequencing under-methylated regions in combination with EST sequencing.

(b) *Functional analysis of the rice genome.* The US is a participant in the international project to sequence the genome of rice. The rice sequence will provide an understanding of genes important to plant growth and productivity, such as those coding for disease and stress resistance, seed development, grain-quality traits, carbon allocation, flowering time, biomass production, and synthesis of compounds valuable for production of fuels and other useful chemicals. Rice is a model system to study because it has a relatively small genome (est 430 Mb), is diploid, is readily transformable and has tractable genetics that include diverse germplasm. These studies in rice will also provide a set of molecular tools to leverage sequence in syntenic species such as maize, wheat, barley, oats, sorghum, and sugarcane. These attributes, in addition to its role as a major food source for the majority of the world's population, makes rice a model for cereal crop genomics.

To build on the sequencing effort now underway, this program area will support rice functional genomic studies that seek to uncover the function of all genes by relating a mutant phenotype with sequence information. Examples of approaches include gene tagging, proteomics, microarrays, and development of knockout lines. Projects are encouraged to be multi-institutional and multi-disciplinary and include collaborations with researchers who can recognize gene mutations affecting the plant life cycle, such as molecular biologists, bioinformaticians, geneticists, pathologists, and physiologists. Collaborations with international programs is appropriate but the lead institution must be from the US. In addition, this program will also

support projects in rice to produce and make publicly available, informative strains and sequences of rice to the international research community; and to develop a public database to consolidate information on mutagenized populations and phenotypic information about mutants characterized.

10.2 Animal Genome. (For clarification on this sub-area, please contact the Program Director, Peter Brayton, at 202-401-5044, e-mail: pbrayton@reeusda.gov.)

There have been substantial efforts in gene mapping of agriculturally important animal species during the past few years. This effort, coupled with recent advances in gene discovery, defining molecular sites on the chromosomes (such as microsatellites), and the development of more sophisticated bioinformatics, has resulted in gene maps with varying density for animal species. Generally, the gene maps have advanced sufficiently that they can begin to be used for marker-assisted selection of progeny and to begin the process of defining genes that control complex traits of economic importance, such as milk production, growth, litter size and disease resistance; however, map densities for some species are far below what is considered optimal for practical application.

This program will emphasize: defining and mapping functional genes through analysis of ESTs, the development of high density comparative gene maps across animal species, identification and mapping of genes affecting traits of economic importance, and development of strategies to effectively use genomic information to enhance genetic improvement of agriculturally important animal species. A considerable degree of linearity in gene order and chromosomal synteny occurs across species. Consequently, the soon-to-be-completed sequencing of the human and mouse genomes will allow reasonable predictions about gene location and relative order without sequencing entire genomes of agricultural animal species. By emphasizing the functional genomics of agriculturally important traits, this program will use information already obtained from other genomic efforts to advance U.S. agriculture in the most cost-effective and expedient manner. Education programs are also needed, not only to apply genomic information effectively, but also to promote understanding of the genomic technologies to all sections of the population, including producers and agricultural professionals.

Proposals are solicited that address one or more of the following areas in animal genomics: (a) develop high density comparative gene maps, which include human and mouse, across agricultural animal species (cattle, sheep, swine, horses, poultry species and aquaculture species); (b) develop high throughput methods for monitoring gene expression in response to environmental stimuli; (c) conduct quantitative trait loci (QTL) analysis and marker assisted selection on large populations of agricultural animals, which may include detailed mapping and sequencing of those loci controlling or having a major effect on economically important traits; (d) develop bioinformatic software to facilitate comparative gene mapping; and (e) develop education programs on new developments in agricultural animal genome research for outreach to producers and students.

10.3 Microbe Genomics. (For clarification of this sub-area, contact the Program Director, Ann Lichens-Park, at (202)-401-6466; e-mail: apark@reeusda.gov.)

Microorganisms dominate the planet in terms of total mass, species diversity, and metabolic range. They include not only pathogens, but also microbes that are beneficial to higher organisms. Many are of enormous present and future economic value. Although genomic information in itself is only a sequence of bases, it provides a framework for understanding how the organism functions and lives. This knowledge can be used to understand why an organism may be pathogenic or beneficial to a plant or animal, or how its properties might be exploited in metabolic engineering, bioremediation, development of sensitive and specific diagnostic tools, improved treatments and preventatives, or more effective vaccines. Knowledge of the genomes of microorganisms is expected to be the driving force for research in the life sciences, including agriculture, forestry, and food safety, over the next quarter century.

This program is designed primarily to encourage competitive research grant applications in support of high-throughput sequencing of genomes of microorganisms (including bacteria, fungi, mollicutes, and protozoa) that are important to the productivity and sustainability of agriculture and forestry, and to the safety and quality of the nation's food supply. This integrated program will provide whole genome sequence data and mapping information on microorganisms that have an impact on agriculture, and extension and education programs to apply this

knowledge to agricultural challenges. Sequencing proposals also should incorporate an education or extension component within the scope of the project to provide a more holistic approach to the problem. Education or extension components may focus on genomics technology or on computational biology and informatics.

It is recognized that complete genome coverage with no gaps is the most desirable end-point for whole genome sequencing. However, agriculturally relevant microbes encompass a sizable number of microorganisms relevant to animals, plants, and natural resources. To date, very few agricultural microbes have been, or are in the process of being, sequenced. Consequently, agriculture lags far behind other fields, such as human health and energy production, with respect to microbial genomics. For this reason, this program encourages investigators to attempt lower level (e.g., 3X–5X) coverage to provide data on multiple organisms. In this manner, the amount of information will be maximized, the program jump-started, and the funds spread across several areas relevant to agriculture. A larger community of agricultural researchers will be able to benefit quickly from the data that are produced.

As a longer term goal, the program will likely request full genome coverage of several (or all) of these organisms. Therefore, to the extent consistent with the Bayh-Dole Act, investigators must plan to make available to the scientific community, upon request, the strains or isolates used, high quality genomic DNA from the organism, and an appropriate set of verified clones developed during the course of the sequencing project. Either a cost-recovery system or use of a commercial repository is permissible, provided that the plan is outlined in the proposal, with an appropriate budget. These reagents should be made available for a minimum of five years.

Note, however, that for smaller genomes, or genomes that may already be sequenced with low coverage, it is acceptable to propose sequencing with high level coverage (e.g. 10X) as long as the total budget is within the limits outlined in the awards subsection.

Choices of organism will be open to those whose sequences are not already being made publicly available. Examples might include high priority pathogens of animals (e.g., *Mycobacterium paratuberculosis*, *Pasteurella haemolytica*, *Lawsonia intracellularis*, *Eimeria* spp.), plants (e.g., *Pseudomonas syringae*, *Erwinia* spp., *Clavibacter* spp., *Aspergillus* spp.), or of food-borne origin (e.g., *Yersinia*

enterocolitica). Choices might also include beneficial/useful organisms such as ones from soil (e.g., *Rhizobium* spp., *Methylobacterium extorquens*, *Pseudomonas* spp.) or rumen (e.g., *Fibrobacter succinogenes*, *Ruminococcus albus*). Microorganisms relevant to aquaculture species and horses are included, along with microorganisms of animals raised for food and fiber. By the time this solicitation is released, it is possible that the sequencing of one or more of these example organisms may already be funded for the public domain; inclusion here does not automatically guarantee a high priority for sequencing.

Clearly, a large number of microorganisms fit this broad criterion of relevance, and in this solicitation it is not the intention of CSREES to dictate which organisms should be sequenced. Rather, the choice of organism(s) will be left to the applicant(s) who must justify selection(s) and address all of the following criteria:

- (a) Economic importance and relevance to U.S. agriculture;
- (b) Avoidance of organism strains whose sequences are already being targeted by others, unless this information will not be in the public domain. To help assess the current sequencing status for particular microorganisms, applicants are strongly encouraged to visit websites that summarize completed and on-going sequencing projects. For example, the following URL sites may prove useful:
<http://www.tigr.org/tdb/mdb/mdb.html>;
http://www.doe.gov/production/ober/EPER/mig_cont.html;
<http://www.niaid.nih.gov/dmid/genomes/default.htm>;
<http://www.sanger.ac.uk/Projects/>;
<http://www.genome.wisc.edu>;
<http://www.genome.wustl.edu/gsc/index.shtml>;

- (c) Unique biological or environmental features;
- (d) Broad interest to a significantly sized community of scientists or agriculturalists;

- (e) Genetic tractability, i.e. the ease with which genetic studies, such as crosses, genome modifications etc. can be performed;

Two additional criteria (position in the taxonomic tree and evolutionary significance) might also be addressed if these are considered relevant to the choice of organism. Also, it is realized that some organisms may be of profound agricultural importance but not easily cultured or subjected to genetic analysis, and therefore are strong candidates for sequencing.

Protozoa, fungi and some bacteria have relatively large genomes, not easily

completed under the support of a single grant. Therefore, requests for partial funding of a genome are allowable as long as future plans for completing the work are outlined. In these instances, investigators are encouraged to seek partners, in either the form of consortia or support from other sources, so that the sequence can be completed in a reasonable time-frame. As long as the goals and limits of the individual projects are clearly addressed and relevant to agriculture, such cooperative projects are encouraged, as are international collaborations. The expected outcome of the project will be a high quality sequence, much or all of it contiguous, with annotation of open reading frames and deposit in a publicly accessible data base. Additionally, for eukaryotic organisms, applications may propose large-scale EST projects. For these larger genomes, applicants should indicate the status of efforts supported by other funding agencies and how these efforts would be coordinated with a USDA-funded activity.

Investigators are to provide detailed information on the organism(s) chosen, the method of library preparation and all other pertinent methodological information. Mechanisms to assess validity and accuracy of the data must be described in the proposal. All cloning and sequencing technologies/strategies, particularly ones that are novel, should be described and must be applicable to future efforts to expand coverage. In judging the merits of a proposal, the speed, level of accuracy, and cost effectiveness of the proposed work will be important issues and considered one of the evaluation criteria under this program. The number of bases to be sequenced per unit time and an estimate of the dollars required to produce a specific amount of base sequence must be calculated. The latter value should include the costs of generating clones, assembly of sequence and annotation, as well as true sequencing costs.

10.4 Bioinformatics. (For clarification of this topic area, contact the Program Director, Gail Mclean, at 202-401-6060, e-mail: gmclean@reeusda.gov.)

The vast amounts of data being generated by genomic research only will be of use to plant, animal and microbial improvement and protection if technologies are developed to efficiently utilize genomic sequence, gene maps and gene function information. In addition, new cadres of scientists must be trained in the use of these technologies. The science of bioinformatics and computational biology, which includes the methods by which genomic data can be sorted,

categorized, and used most effectively, must be improved. Because of the interdisciplinary nature of genomic science, bioinformatic research provides an ideal opportunity for a range of scientists, including engineers, computer scientists, chemists, and biologists, to work together in a collaborative environment. This program seeks to support proposals to develop new bioinformatics technologies, to apply existing technology from the human genome and other genomic projects to agricultural genomics, and to provide training for the enhancement of future human capital with expertise in bioinformatics and computational biology.

This sub-area will help to develop new bioinformatic tools with specific application to agricultural systems and to train scientists in the theory, computational implementation and biological application of the information sciences (including computer science, statistics and mathematics) for the improvement of animal, plant and microbial species of agricultural importance.

Successful applicants to this program will develop an interdisciplinary program which combines research and education or extension activities. Projects may involve experts in computer science, software engineering, genomics, genetics, plant, animal, or microbial improvement, or related sciences as well as individuals with an interest in the development of education and training programs in bioinformatics and computational biology.

Applicants to this program should address technological and knowledge gaps in the development of bioinformatics tools specifically related to plant, animal or microbial genomic data. Research should include but is not limited to the development of: (a) software, algorithms, and database management techniques for the rapid cataloging and access of genomic data, including improved content and utility, improved communication among databases and greater linkages between genomic and phenotypic data; (b) analytical computation tools for the analysis of genomic sequence data for predicted gene function, modeling of biochemical pathways in plant and animal systems, map generation, and statistical techniques for the identification of genes of traits needed to improve the productivity of agriculturally important plant and animal species; and (c) computational applications for capturing, displaying and analyzing information about sequence variation, which will allow for greater accessibility of plant, animal and

microbial genomic data for improvement and protection.

Successful proposals will also include a strong focus on bioinformatics training. Training programs should address the current gap in the availability of professionals trained in both plant, animal, and microbe improvement and bioinformatics. Evidence of infrastructure which encourages or enables the interaction of biologists and computational scientists must be evident in the proposal. Approaches to training may include, but are not limited to: (a) the development of courses at the undergraduate and graduate level in bioinformatics/computational biology; (b) programs which include summer institutes, short courses, sabbaticals or training centers designed to educate and train faculty and/or graduate students in bioinformatics; (c) development of training modules for agricultural professionals, such as certified crop advisors, farm managers, etc., in the use of genomic data in plant and animal improvement; or (d) development of secondary education science teaching modules to introduce young students to the bioinformatic/computational biological sciences.

2. Agricultural Biotechnology (Program Area 11.0)

The application of biotechnology to agriculture has great potential for supplying the world with food and fiber in a sustainable manner. This technology is expected to increase productivity of existing farmlands while reducing the negative environmental effects of traditional production methods by reducing the need for antibiotics, fertilizers, herbicides, hormones, and pesticides. Biotechnology may also facilitate development of products with improved nutritional and economic benefits, or products with novel food, agricultural, or industrial uses.

Successful application of this technology to food and agriculture requires a sufficient level of consumer acceptance of biotechnology-derived products to provide economic incentive to product developers. Consumer acceptance is currently affected by doubts about biotechnology in food and agriculture. Research and education focusing on reducing present and predicted risks associated with agricultural biotechnology will aid in alleviating public concerns. Mechanisms for increasing public awareness of the benefits, as well as the risks, of biotechnology-derived products are needed to provide consumers and policymakers with the facts they need to

make informed decisions about production and trade of biotechnology-derived foods and products.

This program area will support research, extension, and education activities that address public questions and concerns about agricultural biotechnology. High priority will be given to projects that integrate these three activities. Supported activities will advance this goal by assessing and reducing present and anticipated risks associated with products derived through biotechnology, and by maximizing knowledge and understanding of both risks and benefits accrued to the public by these products.

11.1 Effects Agricultural Biotechnology on Human, Animal and Plant Health. (For clarification of this program area, contact the Program Directors, Dan Jones at (202) 401-6854; email: ddjones@reeusda.gov; or Deborah Sheely at (202) 401-1924, e-mail: dsheely@reeusda.gov.)

Research, extension, and education activities regarding the effects of genetically modified (GM) food on human, animal, and plant health, include but are not limited to: (a) approaches for anticipating, detecting, and managing allergenicity in new GM products; (b) the role of GM products in the development of antibiotic resistance; (c) secondary metabolite formation and how this may affect food and feed; (d) changes in bioavailability of essential nutrients; (e) development of new and enhanced testing and evaluation methods of biologically modified products that ensure human and animal safety; (f) techniques to minimize movement of transgenes to non-target organisms or to prevent expression of transgenes in non-target organisms; (g) management systems to slow the evolution of resistance to transgenic protection against pests and diseases; (h) development of experiential learning opportunities for students, academics, and agricultural professionals to study the effects of GM food and feed on humans and animals; (i) development of outreach programs to explain the risks and benefits of GM food and feed on human and animal health.

Proposals involving genetically modified functional foods should direct their proposals to section 12.2 (Nutritional Impact of Functional Foods).

11.2 Social and Economic Aspects of Agricultural Biotechnology. (For clarification of this program area, contact the Program Directors, Dan Jones at (202) 401-6854; email: ddjones@reeusda.gov; or Deborah Sheely at (202) 401-1924, e-mail: dsheely@reeusda.gov.)

Agricultural biotechnology has sparked debate on a variety of topics, including: food safety; the environment; trade, business, and economics; industry structure and consolidation; regulatory sufficiency; product labeling; and diverse value systems. Proposals should draw on these debates.

Projects/programs that address the objective and perceived benefits and risks associated with biotechnology faced by producers, distributors, consumers, and the general public are encouraged. Possible topics include, but are not limited to: (a) effects of biotechnology on market structure and concentration; (b) social and economic consequences of limited germplasm access; (c) consumer acceptance of biologically modified food and feed; and (d) family, community and other contextual effects on biotechnology-related practices of producers, distributors, and consumers.

Proposals in these areas may include research, extension, and education efforts for producers, consumers, opinion leaders, and others on the full range of challenges and opportunities associated with modern agricultural biotechnology. Such efforts should be designed and conducted through collaboration with partners such as government, industry, universities, public interest and consumer groups. In addition, proposals appropriate to this section may include education programs for students on the history and development of biotechnology in agriculture, including crop breeding to modern gene insertion techniques. These programs should include curricula that cover the ethics (social and environmental) behind biotechnology as well as the potential benefits and costs of genetically modified organisms and any social and institutional safeguards that exist or are needed to protect the public interest.

3. Food Safety and the Role of Nutrition in Health (Program Area 12.0)

This program area concentrates resources on two critical areas in nutrition: factors affecting food and nutrition behavior of consumers; and the nutritional impact of functional and designer foods. A third program area will fund research, extension and education programs to help producers implement good agricultural practices for reducing microbial contamination on raw agricultural commodities. A key anticipated benefit of this initiative will be to strengthen campus-based educational programs and to promote the internationalization of research, teaching, and extension/outreach

activities related to nutrition and food safety.

12.1 Factors Affecting Food and Nutrition Behavior of Consumers. (For clarification of this sub-area, contact the Program Director, Etta Saltos, at (202) 401-5178; e-mail: esaltos@reeusda.gov.)

The most fundamental knowledge gap in nutrition research is in understanding why people choose what they choose to eat. Although USDA has issued dietary guidance for consumers for over a century and, together with the Department of Health and Human Services, has formulated Federal nutrition policy in the form of the Dietary Guidelines for Americans for 20 years, we know that many consumers are not following this guidance. According to the Department's 1996 Healthy Eating Index, a measure of how Americans' diets fare in meeting the recommendations of the Dietary Guidelines, only 12 percent of Americans have diets that can be classified as "good;" 71 percent have diets that are considered to "need improvement" and 17 percent are classified as having "poor" diets. Additionally, the prevalence of obesity in the United States increased from 12 percent in 1991 to 18 percent in 1998. USDA researchers have found that in children the risk of becoming obese increases as family income decreases. Community-based research on food systems has demonstrated limited food choices in low-income communities as insufficient resources limit grocery retail establishments in economically deprived areas. Food intake of low-income individuals is dramatically affected by environmental availability of food, especially fruits and vegetables. Food stamp recipients sometimes have difficulty stretching food dollars through the month, creating an atmosphere of food insecurity late in the month, affecting food choices.

Food choice behavior is influenced by a variety of factors ranging from available income to physiologic need to societal standards. Knowledge of how these factors interact to affect food choices is limited. Nutrition experts agree that for nutrition interventions to be successful, they should be behaviorally-based, but the gaps in knowledge of consumer dietary behavior limits development of such interventions. When behaviorally-based nutrition interventions have been implemented, evaluation of the outcomes of such interventions has been limited, primarily due to lack of funds.

The goal of this program is to fund projects that produce models of food and nutrition behavior, especially in at-risk populations such as older adults,

low income individuals and overweight individuals, and to use such models to produce behaviorally-based nutrition intervention programs.

This program invites innovative projects on consumer food and nutrition behavior, including: (a) Research on factors influencing dietary behaviors of at-risk populations, including children and adolescents (at home, in school, and in child care and after-school settings), ethnic minorities, low-income individuals, overweight individuals, and older adults; (b) research on behavioral factors that may contribute to the development of obesity; (c) exploration and analysis of the impact of insecure food systems in low-income communities and prevalence of obesity, unhealthy food choices, and related food behaviors; (d) longitudinal studies and studies that use non-self-report methods to measure changes in dietary behavior; (e) multi-disciplinary studies to examine current theory-based models of behavior change; (f) development of intervention(s) at either the individual or community level based on one or a combination of these models; (g) use of a social marketing approach to target nutrition and health messages that lead to behavior changes; and (h) development of innovative cross-training programs in nutrition and the social sciences.

Proposals dealing with health or consumer acceptance of genetically modified organisms/biotechnology should be directed to Program Area 11.1 (Effects of Agricultural Biotechnology on Human, Animal and Plant Health) or 11.2 (Social and Economic Aspects of Agricultural Biotechnology); proposals dealing with the health aspects of functional foods should be directed to Program Area 12.2 (Nutritional Impact of Functional Foods); proposals dealing with consumer food handling behaviors should be directed to existing CSREES programs.

12.2 Nutritional Impact of Functional Foods. (For clarification of this sub-area, please contact the Program Directors, Ram Rao at (202) 401-4929 or Melvin Mathias at (202) 720-4124; e-mail: mmathias@reeusda.gov.)

Functional foods are fresh or processed foods containing significant levels of biologically active components that might provide health benefits or desirable physiological effects beyond basic nutrition. Functional food markets are growing markedly, reaching the billions of dollars level and consumers are increasingly willing to include functional foods in their diets. Considerable scientific information demonstrates that some food components have the potential health

benefits to prevent disease. Additional research is necessary to substantiate the claims of health benefits of the food components and functional foods. Advances in food technology through both traditional processing methodologies, and genetic engineering of foods, have provided the consumer with ever increasing food choices that claim to offer increased health benefits due to selection in favor of certain components.

The goal of this program is to foster research and outreach to improve functional foods from agriculturally important materials. Collaborative international activities, which may lead to the discovery and development of new functional foods, or which improve the prospects for such foods through enhanced production or commercialization, thus improving the prospects for U.S. agricultural products, are encouraged. Activities that fully integrate and encompass the design of commercially feasible functional foods, characterization of bioactive components, measurement of health benefits, and consumer outreach programs will be given priority. Integration should include a holistic approach to developing functional foods, including an analysis of impact on the food system and on health. Applicants are strongly encouraged to seek industry collaboration.

Examples of potential research, extension and education activities include, but are not limited to: (a) creation of foods that have increased amounts of the beneficial components found in fruits, vegetables, grains and animal products; (b) interactive effects of the bioactive components as consumed in the food; (c) improved processes to enhance stability and bioavailability of bioactive components; (d) the design of foods with acceptable sensory attributes; (e) the development of methods to monitor the effectiveness of functional foods on improving health and preventing diseases; (f) analysis to support the issuance of regulatory guidelines to ensure the safety and efficacy of functional food products; and (g) provide information usable by and readily available to health professionals and consumers.

Proposals dealing with genetically modified foods that do not fit under the definition of functional foods described in this section should be directed to Program Area 11.1 (Effects of Agricultural Biotechnology on Human, Animal and Plant Health) or 11.2 (Social and Economic Aspects of Agricultural Biotechnology); proposals dealing with consumer choices of functional foods for health should be

directed to Program Area 12.1 (Factors Affecting Food and Nutrition Behavior of Consumers).

12.3 Reduction of Microbial Hazards on Raw Agricultural Commodities. (For clarification of this sub-area, contact the Program Director, Robin Huettel, at (202)401-5804; e-mail: rhuettel@reeusda.gov.)

Under the President's "Initiative to Ensure the Safety of Imported and Domestic Foods," October 1997, guidelines were developed to aid in the reduction of microbial food safety hazards through good agricultural practices, including growing, harvesting, washing, sorting, packing, and transporting of fruit and vegetables that are generally consumed raw. A "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruit and Vegetables" was issued by the U.S. Department of Health and Human Services, Food and Drug Administration, October 1998. In order to help the growers and producers implement these good agriculture practices, specific areas for research, education and extension programs are needed for on-farm food safety for reducing microbial contamination of raw agricultural commodities.

The goal of this program is to support projects that address minimizing microbial hazards during all aspects of pre-harvest production. Activities that integrate research, extension, and education activities that will eventually aid the grower/producer by providing management strategies for microbial hazards in raw or minimally processed fruits and vegetables will be given priority. The research needs are necessary for the development of education programs, materials, and resources for education and outreach to growers and producers of raw or minimally processed fruits and vegetables. Information and practical skills related to the appropriate management strategies must be transferred to growers and producers through effective food safety education and outreach for the implementation of good agricultural practices.

Examples of potential research, extension, and education activities include but are not limited to: (a) Research on the macro and micro environments that microbes inhabit, such as biofilm formation and pathogen attachment; (b) breeding of resistant cultivars that would reduce the likelihood of contamination by pathogens by changing surface conditions; (c) understanding the competitiveness, antagonistic, and symbiotic interactions between pathogens and natural flora on produce;

(d) investigation of efficacy of rinse and wash procedures to reduce pathogens in surface treatments; (e) determination of bacterial stress responses to stimuli, such as cold, heat, pH and disinfectants; (f) reduction or elimination of pathogens from compost, prevention of re-contamination of properly treated compost; (g) defining physiological or genetic mechanisms that microbes utilize to become resistant to traditional food safety barriers, including development, amplification, and maintenance of resistance; (h) understanding mechanisms to reduce or prevent pathogen contamination during transport such as the use of controlled atmospheres and temperature control; (i) development of a higher education program that would provide the knowledge needed by crop consultants and other professionals in recognizing potential microbial hazards in grower/production fields, developing mitigation strategies for reduction of microbial hazards in field and processing, and designing handling and processing technologies to prevent contaminants in raw or minimally processed agriculture commodities; (j) educational research focusing on the development of education methodologies that promote on-farm adoption and use of safe management strategies for minimizing microbial hazards associated with raw or minimally processed agricultural commodities; (k) educational research focusing on the development and implementation of education and outreach programs incorporating safe management strategies for domestic and international growers and producers of raw or minimally processed agricultural commodities.

Proposals on the pathogens associated with animal manure and transport of contaminants associated with animal manure should be directed to Program Area 14.3 (Animal Manure Management).

4. New Uses for Agricultural Products (Program Area 13.0)

(For clarification of this program area, contact the Program Director, Carmella Bailey, at (202)-401-6443; e-mail: cbailey@reeusda.gov.)

The goal of this program area is to provide for research, extension, and education activities that enhance the competitive value, find new uses for, or establish entirely new non-food agricultural and forestry products, primarily biomass fuel sources and biobased industrial products that can replace petroleum-based fuels and products. Renewable carbon from plants to replace limited fossil-based carbon from petroleum has the potential to

provide additional farm income for producers, and enhance conservation benefits on marginal land. This program area is intended to support Executive Order 13134, Promoting Biobased Products and Bioenergy, which calls for expanded public investment in research and development for biomass production and conversion for energy and chemicals, and Executive Order 13101, Federal Acquisition, Recycling, and Waste Prevention, which creates a market pull for bioenergy and biobased products. Further, these efforts address the issues of resource depletion and environmental degradation, while building new markets for agriculture.

A systems-based approach is required to accomplish the goals of this program area, which encompasses: (a) the development of crop varieties for biomass fuel uses and for raw materials for industrial products; (b) management techniques for incorporating industrial crops into existing cropping systems; (c) processing biomass; (d) product development; (e) test and evaluation; (f) demonstration of final product(s); (g) life cycle cost evaluation of final product(s); and (h) establishing marketing networks. Accordingly, integration of these activities to the maximum extent practicable, are strongly encouraged. A systems-based approach is expected to accelerate research and development and to result in measurable outcomes, i.e. increased production and use of biofuels and biobased products.

In addition, this initiative strongly encourages research, extension and education activities that explicitly recognize, account for, and enhance the interaction among growers, processors, manufacturers, markets and the community. To increase profitability at the farm gate, applicants are encouraged to develop proposals which include post-harvest processing and manufacturing activities at the local level. To facilitate technology transfer and marketing of products, the product demonstration phase should be of sufficient size to generate data for the proposer to conduct a life cycle cost evaluation that includes product performance data, environmental attributes, as described in EPA's Guidelines for Environmentally Preferable Purchasing, and social impacts as appropriate (e.g. impact on economic development in the community).

To the extent possible, proposers are encouraged to incorporate instruction or other classroom-associated activities which strengthen students' knowledge and skill in the discovery, production and/or commercialization phases of new

and alternative use systems. Similarly, proposers are encouraged to incorporate collaborative international activities which may lead to the discovery of new or alternative uses, or which improve the prospects for those uses through enhanced production or commercialization, thus improving the prospects for U.S. farmers in the global market.

5. Natural Resource Management, Including Precision Agriculture (Program Area 14.0)

Successful management of natural resources in an agricultural landscape should address environmental integrity, quality of life, and economic viability. Unfortunately, the interaction of these three conflicting concepts often does not result in an overall sustainable system. The purpose of this program area is to address how best to integrate the needs of production agriculture, the environment, and society, such that an acceptable sustainable system results.

This program area will focus on key environmental problems that are best addressed using a holistic systems approach. Priority will be given to proposals that explicitly address the interaction among production, the environment, and the well-being of producers and the general public. Preference will also be given to multi-state, multi-institutional, and multi-disciplinary projects. The emerging agricultural and natural resource issues to be addressed include: system-wide management of natural resources, particularly involving small and mid-sized tracts of privately owned land within a defined geographic area (watershed or eco-region); encroachment and subsequent environmental impact of invasive native and non-native species (all taxa); conservation of biodiversity; animal waste management; and development and evaluation of precision technologies for efficient and sustainable production and harvesting of agricultural and natural resources.

14.1 Alternative Natural Resource Management Practices for Private Lands. (For further information concerning this program sub-area, contact the Program Director, Larry Biles, at (202) 401-4926; e-mail: lbiles@reeusda.gov.)

As the world's population increases, the demands for delivery of natural resource goods and services will also increase. In addition, there is an increasing demand for diversity in the commodities being produced and an increased recognition that such production changes must be accomplished without adversely

impacting our capacity to ensure the delivery of goods, services and a healthy environment to future generations.

This program will support integrated projects on the development of natural resource management systems (including forest, range, aquatic and wildlife) that improve our capacity to support natural resources. Proposals should present a scientific framework that qualitatively and quantitatively links production practices, societal preferences, demographics, and economic needs to the impacts on natural resources. Preference will be given to proposals that demonstrate the active participation of the user community that is expected to benefit. Proposals should include a plan for coordination among scientists, state and federal agencies, commodity organizations, environmental groups, and producers to deal with the integrated ecological, technological, economic, social and environmental issues in a specified geographic region.

This sub-area of the initiative is intended to provide the research, extension and education information needed to support the management needs of the small and mid-sized aquatic, range, wildlife, and forest systems owners and managers. Projects should address management practices and technologies that will increase the opportunities for the small to mid-sized manager to operate profitable enterprises that respond to the demands for: (a) Alternative natural resources production, (b) sustainable forestry certification, (c) agroforestry, (d) invasive species management across multiple ownerships, (e) wildlife control and management, (f) nutrient management, (g) maintaining or enhancing biodiversity and ecosystem integrity, including restoration of species and ecosystems, (h) coping with the demands imposed by environmental and regulatory requirements within the increasingly mixed distribution of urban, rural, and wildlands management systems, (i) development and enhancement of decision support tools linking regional databases with remote sensing technologies (with suitable resolution for use by the targeted user communities) and management options; and (j) training programs to enhance success and adoption of regionally-appropriate practices.

Proposals submitted to this sub-area will enhance our capacity to integrate regionally appropriate data and information to increase long-term, site-specific, and whole system efficiencies and profitability while both minimizing unintended impacts on natural

resources and enhancing environmental integrity. Proposals are encouraged that use a whole systems approach (economic, environmental, social and community development) to evaluate the practices most conducive to sustaining small and mid-sized land management systems in the U.S. Partnerships with existing regional and/or long-term projects (including those associated with public lands) also are strongly encouraged.

Proposals should contain a clear plan for technology transfer and adoption. Proposals should clearly describe the type (size and distribution) of the system being evaluated and should include provisions that demonstrate an interdisciplinary problem-solving approach to maintain natural resources sustainability and profitability.

Proposals focusing on the financial security and quality of life of small to mid-sized family-owned pastures should be submitted to Program Area 15.0 (Farm Efficiency and Profitability).

14.2 Invasive Species. (For clarification on this sub-area, contact the Program Director, John Obrycki, at (202) 401-4201; e-mail: jobrycki@reeusda.gov.)

The spread of invasive non-native pest species is one of the greatest threats to the long-term health and biological diversity of rural and urban areas. For this program, invasive species are defined as alien species whose introduction does or is likely to cause economic or environmental harm. The invasion of plant, animal, and microbial pests is an issue of critical importance to the nation's land and water resources. No land or water regime is immune and the nation is both losing income and incurring expenses to address these problems. Invasive species have reached the level of national concern because of adverse economic impacts and long-term threats to ecosystem sustainability. In addition, invasive species threaten the effectiveness of established pest management systems.

The invasive species sub-area is in part a response to the President's Executive Order (EO 13 112) on Invasive Species of February 3, 1999. The goal of the Executive Order is to increase coordination of Federal agencies to prevent introductions, provide for control, monitoring and study, and to restore native species and habitats in areas degraded by invasive species. A goal of this program is to coordinate and integrate research, education, and outreach aspects of invasive species problems.

This sub-area will emphasize application of fundamental knowledge to reduce societal losses due to invasive

species. It is critical that proposals take a problem-solving approach to management of invasive species. This program will consider projects that address aspects of invasive species from discovery of novel means to detect, monitor, and manage invasive species to outreach and education activities that promote public awareness of invasive species. Proposals may address the prevention of introductions, as well as, the detection, monitoring, or management of existing invasive species. Proposals that develop mitigation plans to restore the biodiversity of native species and habitats negatively affected by invasive species are also encouraged. A high priority will be placed on proposals that include (a) multiple states, multiple disciplines and multiple institutions, (b) research, extension, or education components, or (c) both. Proposals will be considered that include partnerships with state and local organizations to address extension and educational needs for regional invasive species problems. One of the key elements of the proposal should consider how the approaches taken address the problem of a specific invasive species or group of species.

Taxa of invasive species that are considered in this program include animal, plant, and microbial species that affect the biodiversity of terrestrial and aquatic ecosystems, in agricultural, urban, or forest systems. Proposals submitted to this program could include, but are not limited to, projects that: (a) develop planning and communication strategies to encourage action on invasive species (these activities could be at several levels ranging from local to national scales); (b) evaluate and communicate the risks associated with invasive species introductions; (c) formulate strategies to prevent the introduction of invasive species; (d) develop and implement management systems to facilitate the early detection, monitoring, eradication, containment, or control of invasive species (particularly those cropping systems impacted by implementation of the Food Quality and Protection Act); or (e) provide and implement strategies to restore biodiversity of native species and habitat condition.

Proposals addressing restoration of specific habitats, communities, and ecosystems associated with privately-owned small-midsized forests, grasslands, wetlands, or riparian areas should submit to Program Area 14.1 (Alternative Natural Resource Management Practices for Private Lands).

14.3 Animal Manure Management. (For further information on this program sub-area, contact the Program Director, Richard Hegg at (202) 401-6550; e-mail: rhegg@reeusda.gov.)

There is a great deal of public pressure to prevent the degradation of air, soil, and water resources by food animal production systems and to protect the ecological integrity of forest, rangeland, cropland, aquatic, estuarine, and marine systems. Proper management of manure resulting from these production systems is one of the most critical issues facing the food animal industry. Animal feeding operations vary by region, species, size and management system, so that each operation is site-specific and must be managed accordingly. Physical, chemical and/or biological treatment techniques may be used to reduce the pollution potential of animal manure. Regulation of animal feeding operations at the local, state and federal level is undergoing rapid change.

Proposals for this section will support integrated research, education and extension on regional systems that will ultimately reduce adverse environmental and human health impacts of animal manure. Proposals will be considered that develop and evaluate manure management practices using soils, wetlands, riparian zones, and treatment systems for the protection of natural resources. Proposals taking a watershed, landscape-scale approach are encouraged and could include the transport and fate of nutrients and/or pathogens from animal manure through air, water and soil. The incorporation of comprehensive nutrient management planning in educational programs is encouraged, as is the development of partnerships with already established waste management centers (e.g., the National Center for Manure and Animal Waste Management).

Topic areas that this program sub-area will consider include: (a) Development of rates and methods of land application of manure that are most suitable for a given watershed; (b) determination of the effects of animal nutrition on manure content and quality, and extension of this knowledge to producers who may in turn modify their feed; (c) determination and prediction of odor, gas and particulate matter impacts on the atmosphere and society, and development of management strategies to alleviate such impacts; (d) understanding and predicting source, delivery and fate of pathogens as well as transferring this information to the general public to address concerns or inform them of potential health hazards; (e) resolving community and regulatory

concerns about siting, health and economic issues; (f) determination of water quality impacts of nutrients, pathogens, and other waste products, and the development of strategies to reduce such impacts, and the development of programs to educate the public on such water quality issues; (g) development and implementation of alternative waste treatment technologies; (h) development and marketing of value-added products from animal waste; (i) determination of the transport of antibiotics and/or endocrine disruptors (hormones) in the environment and their potential effects on the environment; and (j) development of alternative animal production systems.

Proposals should address one or more of the following animal groups: swine, dairy, beef, poultry or aquaculture.

14.4 Application of Precision Technologies. (For further information on this Program Area, contact the Program Directors, Preston Jones at (202) 401-1990; e-mail: ppjones@reeusda.gov; or Maurice Horton at (202) 401-4504; e-mail: mhorton@reeusda.gov).

Precision technologies can be valuable tools if their applicability to agriculture and natural resource management can be demonstrated and then adopted. Precision technologies range from defining simple field management zones to complex integration of multiple datasets with the goal of making production and harvesting more efficient and sustainable. Field-scale management using precision technologies is needed to address spatial and temporal variability that limits the efficient use of inputs. Farmers, ranchers, and natural resource managers need tools like decision support systems and sensors in their work places that quantify complex interactions between profitability and the natural resource base. Multidisciplinary partnerships with industry, producers, and the research/education community are encouraged because of the lack of understanding in the decision-making process and the high cost of doing field-scale research. Partnerships with other Federal agencies, such as NASA, and partnerships addressing the needs of small and medium-sized farms, are encouraged.

Proposals submitted to this section will enhance the Nation's capacity to integrate site-specific and whole system efficiency and profitability while minimizing deleterious impacts on natural resources and the environment. Proposals are solicited from, but not limited to, the following areas: (a) Site-

specific yield prediction and resource management based on an improved understanding of how soils, water, nutrients, climate, landscapes, crops and other natural resources interact to influence productivity; (b) decision support systems for complex soil, crop, pest, landscape, irrigation and natural resource management interactions that integrate spatial and temporal variability; (c) Assessment of user needs and development of scientific capabilities, economic and environmental cost-benefit analysis, and documentation of adoption of precision technologies by the user community; (d) sensing of natural resource properties, using both ground-based and remote technologies, and other precision technology applications based on user needs; and (e) training of competent and skilled professionals to transfer precision technology to the user community.

Each proposal should clearly indicate the scope of the management system for which applications are being developed and evaluated. Decision support proposals should include a clear plan for evaluating the suitability (feasibility, efficacy, profitability, required infrastructure, and adoption strategies) of technologies proposed for operations of specified scope. Proposals should include a plan for the propagation of the databases developed or for the maintenance and training necessary for sensor and decision support tool use.

5. Farm Efficiency and Profitability (Program Area 15.0)

(For clarification of this program area, contact the Program Director, Don West, at (202) 720-5633; e-mail: dwest@reeusda.gov; or Denis Ebodaghe, at (202) 401-4385; e-mail: debodaghe@reeusda.gov.)

Dramatic changes in the global agricultural environment and in domestic farm programs have created new challenges for U.S. farmers as they strive to maintain the efficiency and profitability of their operations and the financial viability of their families and communities. This program emphasizes the use of existing data and emerging information to synthesize and deliver knowledge that improves profitability for families operating small and medium-sized farms. Proposals that address the concerns of family-owned farms with limited financial resources will be given priority. Proposals should indicate how target audiences will benefit from the proposed programs/projects.

All proposals submitted to this program area will undergo a peer review in which the efficiency and profitability

of small and medium-sized farms is the most important criterion. New partnerships and new administrative mechanisms that involve universities, industry, profit/non-profit organizations and/or community colleges are also important criteria. Consideration will be given to system approaches useful in meeting the production, marketing, capital and human resource needs associated with dairy, livestock, crop and other commodity operations. This priority area recognizes linkages with natural resources and environmental issues and the importance of strengthening the financial viability of farm operations, families, and communities. Such proposals should provide information on the connections between the sustainability of small and medium-sized farms and the viability of their communities as well as linkages with natural resources and environmental issues.

Projects that utilize a systems approach and are national or regional in scope are encouraged as are those that incorporate research, extension, and educational functions. Proposals that incorporate farmer input in problem identification and have high scientific merit in project design, methodology and analytical procedures will be given priority. Appropriate innovative methodologies are encouraged, including those that make use of electronic technology in delivery of extension and formal education programs. Applicants with a strong track record of working with owners and managers of small and medium-sized farms are encouraged to apply.

Applicants are encouraged to submit research, extension, or education proposals that address one or more of the following areas: (a) development of management (e.g., pest, crop, animal, nutrient, economic) and marketing systems that improve efficiency and profitability, including the reduction of capital and input costs or the diversification of crop and livestock enterprises; (b) development of effective marketing programs, including the use of farmers' markets, community-supported agriculture, marketing to restaurants and schools, cooperative approaches to use of inputs and marketing, organic production and marketing, Internet marketing, global markets, and agritourism; (c) development of farm-based value-added processing and new high-return production and marketing niches; (d) development of improved methods of managing risks faced by farmers and ranchers, including production risks (enterprise diversification, crop insurance, contract production,

cropping systems at risk from implementation of the Food Quality and Protection Act, and new management systems), marketing risks (marketing plans and tools), financial risk (financial and investment analysis, family living costs and financial security), legal issues (contracts and environmental liability), and human resource issues (labor availability, occupational health and safety, managing people, and estate planning); (e) development of programs/projects that improve access to knowledge and decision-making tools. Examples include production decision tools, formal and informal education in entrepreneurship, business planning and marketing for new or modified enterprises, and farm and family financial planning and management. Access should allow producers to increase options for farm efficiency and profitability in regional and local economies, including planning and building community support; (f) development of programs/projects that improve access to and management of financial resources, including physical and production capital, financial services, innovative investment capital strategies, human capital (including availability and effective management of labor), and infrastructure and social capital (community resources and institutions); and (g) development of programs/projects that improve access to and management of environmental resources, including maintenance of environmental quality and conservation issues.

Part III—Preparation of a Proposal

A. Program Application Materials

Program application materials are available at our website (www.reeusda.gov/IFAFS). If you do not have access to our web page or have trouble downloading material, you may contact the Proposal Services Unit, Office of Extramural Programs, USDA/CSREES at (202) 401-5048. When calling the Proposal Services Unit, please indicate that you are requesting forms for IFAFS. These materials may also be requested via Internet by sending a message with your name, mailing address (not e-mail) and phone number to psb@reeusda.gov. State that you want a copy of the Program Description and application materials (orange book) for the Fiscal Year 2000 Initiative on Future Agriculture and Food Systems (IFAFS).

B. Content of Proposals

1. General

The proposal should follow these guidelines, enabling reviewers to more

easily evaluate the merits of each proposal in a systematic, consistent fashion:

(a) The proposal should be prepared on only one side of the page using standard size (8½" x 11") white paper, one inch margins, typed or word processed using no type smaller than 12 point font, and single or double spaced. Use an easily readable font face (e.g., Geneva, Helvetica, Times Roman).

(b) Each page of the proposal, including the Project Summary, budget pages, required forms, and any appendices, should be numbered sequentially.

(c) The proposal should be stapled in the upper left-hand corner. Do not bind. An original and 14 copies (15 total) must be submitted in one package, along with 10 copies of the "Project Summary" as a separate attachment.

(d) If applicable, proposals should include original illustrations (photographs, color prints, etc.) in all copies of the proposal to prevent loss of meaning through poor quality reproduction.

Small or mid-sized institutions: An academic institution is eligible as small or mid-sized if the institution is under 15,000 in total enrollment (including part-time students) and is not listed in Appendix A (Most successful Universities and Colleges for Receiving Federal and/or National Research Initiative Funds.)

2. Cover Page

Each copy of each grant proposal must contain an "Application for Funding", Form CSREES-661. One copy of the application, preferably the original, must contain the pen-and-ink signature(s) of the proposing principal investigator(s)/project director(s)(PI/PD) and the authorized organizational representative who possesses the necessary authority to commit the organization's time and other relevant resources to the project. Any proposed PI/PD or co-PI/PD whose signature does not appear on Form CSREES-661 will not be listed on any resulting grant award. Complete both signature blocks located at the bottom of the "Application for Funding" form.

Form CSREES-661 serves as a source document for the CSREES grant database; it is therefore important that it be completed accurately. The following items are highlighted as having a high potential for errors or misinterpretations:

(a) Title of Project (Block 6). The title of the project must be brief (80-character maximum), yet represent the major thrust of the effort being proposed. Project titles are read by a variety of

nonscientific people; therefore, highly technical words or phraseology should be avoided where possible. In addition, introductory phrases such as "investigation of," "research on," "education for," or "outreach that" should not be used.

(b) Program to Which You Are Applying (Block 7). "IFAFS".

(c) Program Area and Number (Block 8). The name of the program component, e.g. Plant Genome, 10.1 or Behavior of Food Choice, 12.1. should be inserted in this block.

(d) Type of Award Request (Block 13). Check the block for "new."

(e) Principal Investigator(s)/Project Director(s) (PI/PD) (Block 15). The designation of excessive numbers of co-PI/PD's creates problems during final review and award processing. Listing multiple co-PI/PDs, beyond those required for genuine collaboration, is therefore discouraged. Note that providing a Social Security Number is voluntary, but is an integral part of the CSREES information system and will assist in the processing of the proposal.

(f) Type of Performing Organization (Block 18). A check should be placed in the box beside the type of organization which actually will carry out the effort. For example, if the proposal is being submitted by an 1862 Land-Grant institution but the work will be performed in a department, laboratory, or other organizational unit of an agricultural experiment station, box "03" should be checked. If portions of the effort are to be performed in several departments, check the box that applies to the individual listed as PI/PD #1 in Block 15.a.

(g) Other Possible Sponsors (Block 22). List the names or acronyms of all other public or private sponsors including other agencies within USDA and other programs funded by CSREES to whom your application has been or might be sent. In the event you decide to send your application to another organization or agency at a later date, you must inform the identified CSREES Program Director as soon as practicable. Submitting your proposal to other potential sponsors will not prejudice its review by CSREES; however, duplicate support for the same project will not be provided. Complete the "Application for Funding," Form CSREES-661, in its entirety.

(h) One copy of the "Application for Funding" form must contain the signatures (in ink) of the PI/PDs and authorized organizational representative for the applicant organization.

3. Table of Contents

For consistency and ease in locating information, each proposal must contain a detailed Table of Contents just after the cover page. The Table of Contents should contain page numbers for each component of the proposal. Page numbers should begin with the first page of the Project Description.

4. Project Summary

The proposal must contain a Project Summary of 250 words or less on a separate page which should be placed immediately after the Table of Contents and should not be numbered. The names and institutions of all PI/PDs and co-PI/PDs should be listed on this form, in addition to the title of the project. The summary should be a self-contained, specific description of the activity to be undertaken and should focus on: overall project goal(s) and supporting objectives; plans to accomplish the project goal(s); and relevance of the project to IFAFS goals and to U.S. agriculture. The importance of a concise, informative Project Summary cannot be overemphasized. If the lead institution is eligible as a small or mid-sized institution as defined in Part I C., Definitions, of this document, include a separate sentence on the Project Summary page indicating that the institution is "eligible for small and mid-sized consideration."

5. Project Description

The written text may not exceed 15 single- or double spaced pages of written text for standard proposals and 20 single- or double-spaced pages for Consortia proposals including figures and tables, but excluding citations.

Standard Proposals. Each standard proposal's Project Description should contain the following:

a. *Introduction*—A clear statement of the long-term goal(s) and supporting objectives of the proposed activities should be included. Summarize the body of knowledge which substantiates the need for the proposed project. Describe ongoing or recently completed significant activities related to the proposed project including the work of key project personnel. Preliminary data/information pertinent to the proposed project should be included;

b. *Relevance and significance*—The objectives' specific relationship to the goals of the IFAFS and to the particular program area should be stated. Include a description of the significance of the activity and its value in improving agriculture through research, education and extension. Clearly describe the potential impact of the project.

c. *Approach*—The activities proposed or problems being addressed must be clearly stated and the approaches being applied clearly described. The following should be included: (1) A description of the activities proposed; (2) methods to be used in carrying out the project, including the feasibility of the methods; (3) expected outcomes; (4) means by which results will be analyzed, assessed, or interpreted; and (5) how results or products will be used.

d. *Time Table*—Provide an expected time line for completing the project in the requested duration.

e. *Evaluation and Monitoring*—Provide a plan for assessing and evaluating the accomplishments of the stated proposal objectives during the project and describe ways to determine the effectiveness of the end results during and upon termination of the project.

f. *Collaborative Arrangements*—Identify collaborations and provide a full explanation of the nature of the collaborations.

Consortia Proposals. Each Consortia Proposal should include all the above items required for a Standard Proposal, but should also include the following:

a. Substantiate the need for a Consortium as opposed to a single project approach including how the consortia will add value over funding of separate efforts.

b. *Management Plan*—It is expected that Consortia projects will require more extensive and complicated coordination and collaboration than is typically proposed for Standard Projects. Therefore, explain how the Consortia will be managed to ensure efficient administration of the grant and how activities will be integrated most effectively. Place this description after the Project Description.

c. *Evaluation and Monitoring of Project Administration*.—In addition to the evaluation and monitoring of accomplishments associated with the Consortium, evaluation and monitoring of the administration of the Consortium must also be included. This description should include how funds and resources will be allocated so that collaborative participation of all parties throughout the duration of the project is ensured. This description should be placed after the Evaluation and Monitoring Section described above under Standard Proposals.

6. Appendices to Project Description

Appendices to the Project Description are allowed if they are directly germane to the proposed project and are limited to a total of two of the following: reprints (papers that have been

published in peer reviewed journals) and preprints (manuscripts in press for a peer reviewed journal; these must be accompanied by a letter of acceptance from the publishing journal).

7. Key Personnel

All senior personnel who are expected to be involved in the effort should be clearly identified. For each person the following should be included:

a. The roles and responsibilities of each PI/PD should be described;

b. An estimate of time commitment for each PI/PD; and

c. *Vitae* of each PI/PD, senior associate and other professional personnel. This section should include vitae of all key persons who are expected to work on the project, whether or not CSREES funds are sought for their support. The vitae should be limited to two (2) pages in length, excluding publication lists. A chronological list of all publications in refereed journals during the past four (4) years, including those in press, must be provided for each project member for which a curriculum vitae is provided. Also list those non-refereed technical publications which have relevance to the proposed project. All authors should be listed in the same order as they appear on each paper cited, along with the title and complete reference as these usually appear in journals.

8. Conflict-of-Interest List

A Conflict-of-Interest List must be provided for all individuals involved in the project (identified as key personnel). Each list should be on a separate page and include alphabetically the full names of the individuals in the following categories: (a) All collaborators on projects within the past four years, including current and planned collaborations; (b) all co-authors on publications within the past four years, including pending publications and submissions; (c) all persons in your field with whom you have had a consulting or financial arrangement within the past four years who stand to gain by seeing the project funded; and (d) all thesis or postdoctoral advisees/advisors within the past four years (some may wish to call these life-time conflicts). This form is necessary to assist program staff in excluding from proposal review those individuals who have conflicts-of-interest with the personnel in the grant proposal. The Program Director, under the specific area or sub-area, must be informed of any additional conflicts-of-interest that arise after the proposal is submitted.

9. Collaborative and/or Subcontractual Arrangements

If it will be necessary to enter into formal consulting or collaborative arrangements with others, such arrangements should be fully explained and justified. In addition, evidence should be provided that the collaborators involved have agreed to render these services. If the need for consultant services is anticipated, the proposal narrative should provide a justification for the use of such services, a statement of work to be performed, and a resume or curriculum vita for each consultant. For purposes of proposal development, informal day-to-day contacts between key project personnel and outside experts are not considered to be collaborative arrangements and thus do not need to be detailed.

All anticipated subcontractual arrangements also should be explained and justified in this section. A proposed statement of work and a budget for each arrangement involving the transfer of substantive programmatic work or the providing of financial assistance to a third party must be provided. Agreements between departments or other units of your own institution and minor arrangements with entities outside of your institution (e.g., requests for outside laboratory analyses) are excluded from this requirement.

If you expect to enter into subcontractual arrangements, please note that the provisions contained in 7 CFR Part 3019, USDA Uniform Administrative Requirements for Grant and Other Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations, and the general provisions contained in 7 CFR Part 3015.205, USDA Uniform Federal Assistance Regulations, flow down to subrecipients. In addition, required clauses from Sections 40—48 (“Procurement Standards”) and Appendix A (“Contract Provisions”) to 7 CFR Part 3019 should be included in final contractual documents, and it is necessary for the subawardee to make a certification relating to debarment/suspension.

10. Budget

a. Budget Form—Prepare the budget, Form CSREES—55, in accordance with instructions provided. A budget form is required for each year of requested support. In addition, a cumulative budget is required detailing the requested total support for the overall project period. The budget form may be reproduced as needed by applicants. Funds may be requested under any of

the categories listed on the form, provided that the item or service for which support is requested is allowable under the authorizing legislation, the applicable Federal cost principles, and these program guidelines, and can be justified as necessary for the successful conduct of the proposed project. Applicants must also include a Budget Narrative to justify their budgets (see section 11 below.)

The following guidelines should be used in developing your proposal budget(s):

1. Salaries and Wages. Salaries and wages are allowable charges and may be requested for personnel who will be working on the project in proportion to the time such personnel will devote to the project. If salary funds are requested, the number of Senior and Other Personnel and the number of CSREES-Funded Work Months must be shown in the spaces provided. Grant funds may not be used to augment the total salary or rate of salary of project personnel or to reimburse them for time in addition to a regular full-time salary covering the same general period of employment. Salary funds requested must be consistent with the normal policies of the institution.

2. Fringe Benefits. Funds may be requested for fringe benefit costs if the usual accounting practices of your organization provide that organizational contributions to employee benefits (social security, retirement, etc.) be treated as direct costs. Fringe benefit costs may be included only for those personnel whose salaries are charged as a direct cost to the project.

3. Nonexpendable Equipment. Nonexpendable equipment means tangible nonexpendable personal property including exempt property charged directly to the award having a useful life of more than one year and an acquisition cost of \$5,000 (or lower, depending on institutional policy) or more per unit. As such, items of necessary instrumentation or other nonexpendable equipment should be listed individually by description and estimated cost in the Budget Narrative. This applies to revised budgets as well, as the equipment item(s) and amount(s) may change.

4. Materials and Supplies. The types of expendable materials and supplies which are required to carry out the project should be indicated in general terms with estimated costs in the Budget Narrative.

5. Travel. The type and extent of travel and its relationship to project objectives should be described briefly and justified. If foreign travel is proposed, the country to be visited, the

specific purpose of the travel, a brief itinerary, inclusive dates of travel, and estimated cost must be provided for each trip. Airfare allowances normally will not exceed round-trip jet economy air accommodations. U.S. flag carriers must be used when available. See 7 CFR Part 3015.205(b)(4) for further guidance.

6. Publication Costs/Page Charges. Include anticipated costs associated with publications in a journal (preparing and publishing results including page charges, necessary illustrations, and the cost of a reasonable number of coverless reprints) and audio-visual materials that will be produced. Photocopying and printing brochure, etc., should be shown in Section I., “All Other Direct Costs” of Form CSREES—55.

7. Computer (ADPE) Costs. Reimbursement for the costs of using specialized facilities (such as a university- or department-controlled computer mainframe or data processing center) may be requested if such services are required for completion of the work.

8. All Other Direct Costs. Anticipated direct project charges not included in other budget categories must be itemized with estimated costs and justified in the Budget Narrative. This also applies to revised budgets, as the item(s) and dollar amount(s) may change. Examples may include space rental at remote locations, subcontractual costs, and charges for consulting services, telephone, facsimile, shipping costs, and fees necessary for laboratory analyses. You are encouraged to consult the “Instructions for Completing Form CSREES—55, Budget,” of the Application Kit for detailed guidance relating to this budget category. Form AD—1048 must be completed by each subcontractor or consultant and retained by the grantee.

9. Indirect Costs—Section 1462 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3310) limits indirect costs for this program to 19 percent of total Federal funds provided under each award. Therefore, the recovery of indirect costs under this program may not exceed the lesser of the institution’s official negotiated indirect cost rate or the equivalent of 19 percent of total Federal funds awarded. If no rate has been negotiated, a reasonable dollar amount (equivalent to less than 19 percent of total Federal funds requested) in lieu of indirect costs may be requested, subject to approval by USDA.

b. Budget Narrative—All budget categories, with the exception of Indirect Costs for which support is

requested, must be individually listed (with costs) and justified on a separate sheet of paper and placed immediately behind the Budget Form. Explanations of matching funds or lack thereof on commodity-specific projects also are to be included in this section.

c. Matching Funds—If an applicant concludes that matching funds are not required as specified in Part I (e), a justification should be included in the Budget Narrative. CSREES will consider this justification when ascertaining final matching requirements. CSREES retains the right to make final determinations regarding matching requirements.

For those grants requiring matching funds as specified in Part I (e), proposals should include written verification of commitments of matching support (including both cash and in-kind contributions) from third parties.

Written verification means:

(a) For any third party cash contributions, a separate pledge agreement for each donation, signed by the authorized organizational representatives of the donor organization and the applicant organization, which must include: (1) The name, address, and telephone number of the donor; (2) the name of the applicant organization; (3) the title of the project for which the donation is made; (4) the dollar amount of the cash donation; and (5) a statement that the donor will pay the cash contribution during the grant period; and

(b) For any third party in-kind contributions, a separate pledge agreement for each contribution, signed by the authorized organizational representatives of the donor organization and the applicant organization, which must include: (1) The name, address, and telephone number of the donor; (2) the name of the applicant organization; (3) the title of the project for which the donation is made; (4) a good faith estimate of the current fair market value of the third party in-kind contribution; and (5) a statement that the donor will make the contribution during the grant period.

The sources and amount of all matching support from outside the applicant institution should be summarized on a separate page and placed in the proposal immediately following the Budget Narrative. All pledge agreements must be placed in the proposal immediately following the summary of matching support.

The value of applicant contributions to the project shall be established in accordance with applicable cost principles. Applicants should refer to OMB Circulars A-21, Cost Principles for Educational Institutions, A-87, Cost

Principles for State, Local, and Tribal Governments, A-122, Cost Principles for Non-Profit Organizations, and for for-profit organizations, the cost principles in the Federal Acquisition Regulation at 48 CFR Subpart 31.2 (see 7 CFR 3015.194).

11. Current and Pending Support

All proposals must contain Form CSREES-663 listing other current public or private support (including in-house support) to which key personnel identified in the proposal have committed portions of their time, whether or not salary support for person(s) involved is included in the budget. Analogous information must be provided for any pending proposals that are being considered by, or that will be submitted in the near future to, other possible sponsors, including other USDA Programs or agencies. Concurrent submission of identical or similar proposals to the possible sponsors will not prejudice proposal review or evaluation by the CSREES for this purpose. However, a proposal that duplicates or overlaps substantially with a proposal already reviewed and funded (or to be funded) by another organization or agency will not be funded under this program. Note that the project being proposed should be included in the pending section of the form.

12. Assurance Statement(s), (Form CSREES-662)

A number of situations encountered in the conduct of projects require special assurances, supporting documentation, etc., before funding can be approved for the project. In addition to any other situation that may exist with regard to a particular project, it is expected that some applications submitted in response to these guidelines will involve the following:

a. Recombinant DNA or RNA Research

As stated in 7 CFR Part 3015.205 (b)(3), all key personnel identified in the proposal and all endorsing officials of the proposing organization are required to comply with the guidelines established by the National Institutes of Health entitled, "Guidelines for Research Involving Recombinant DNA Molecules," as revised. If your project proposes to use recombinant DNA or RNA techniques, you must so indicate by checking the "yes" box in Block 19 of Form CSREES-661 (the Cover Page) and by completing Section A of Form CSREES-662. For applicable proposals recommended for funding, Institutional Biosafety Committee approval is

required before CSREES funds will be released.

b. Animal Care. Responsibility for the humane care and treatment of live vertebrate animals used in any grant project supported with funds provided by CSREES rests with the performing organization. Where a project involves the use of living vertebrate animals for experimental purposes, all key project personnel identified in a proposal and all endorsing officials of the proposing organization are required to comply with the applicable provisions of the Animal Welfare Act of 1966, as amended (7 U.S.C. 2131 et seq.) and the regulations promulgated thereunder by the Secretary in 9 CFR Parts 1.2, 3, and 4 pertaining to the care, handling, and treatment of these animals. If your project will involve these animals, you should check "yes" on block 20 of CSREES-661 and complete Section B of Form CSREES-662. In the event a project involving the use of live vertebrate animals results in a grant award, funds will be released only after the Institutional Animal Care and Use Committee has approved the project.

c. Protection of Human Subjects—Responsibility for safeguarding the rights and welfare of human subjects used in any grant project supported with funds provided by CSREES rests with the performing organization. Guidance on this issue is contained in the National Research Act, Pub. L. No. 93-348, as amended, and implementing regulations promulgated by the Department under 7 CFR Part 1c. If you propose to use human subjects for experimental purposes in your project, you should check the "yes" box in Block 21 of Form CSREES-661 and complete Section C of Form CSREES-662. In the event a project involving human subjects results in a grant award, funds will be released only after the appropriate Institutional Review Board has approved the project.

13. Certifications

Note that by signing Form CSREES-661 the applicant is providing certifications required by 7 CFR Part 3017, as amended, regarding Debarment and Suspension and Drug Free Workplace, and 7 CFR Part 3018, regarding Lobbying. The certification forms are included in the application package for informational purposes only. These forms should not be submitted with the proposal since by signing form CSREES-661 your organization is providing the required certifications. If the project will involve a subcontractor or consultant, the subcontractor/consultant should submit a form AD-1048 to the grantee

organization for retention in their records. This form should not be submitted to USDA.

14. Compliance with the National Environmental Policy Act (NEPA) Form CSREES-1234

As outlined in 7 CFR Part 3407 (the Cooperative State Research, Education, and Extension Service regulations implementing NEPA), the environmental data for any proposed project is to be provided to CSREES so that CSREES may determine whether any further action is needed. In some cases, however, the preparation of environmental data may not be required. Certain categories of actions are excluded from the requirements of NEPA.

In order for CSREES to determine whether any further action is needed with respect to NEPA, pertinent information regarding the possible environmental impacts of a particular project is necessary; therefore, Form CSREES-1234, "NEPA Exclusions Form," must be included in the proposal indicating whether the applicant is of the opinion that the project falls within a categorical exclusion and the reasons therefore. If it is the applicant's opinion that the proposed project falls within the categorical exclusions, the specific exclusion must be identified. Form CSREES-1234 and supporting documentation should be included as the last page of this proposal.

Even though a project may fall within the categorical exclusions, CSREES may determine that an Environmental Assessment or an Environmental Impact Statement is necessary for an activity, if substantial controversy on environmental grounds exists or if other extraordinary conditions or circumstances are present which may cause such activity to have a significant environmental effect.

D. Submission of Proposals

1. When to Submit (Deadline Date)

Proposals must be transmitted by May 8, 2000, as indicated by postmark or date of courier bill of lading. Proposals transmitted after this date will not be considered for funding.

2. What to Submit

An original and 14 copies must be submitted. In addition submit 10 copies of the proposal's Project Summary. All copies of the proposals and the Project Summaries must be submitted in one package.

3. Where to Submit

Applicants are strongly encouraged to submit completed proposals via overnight mail or delivery service to ensure timely receipt by the USDA. The address for hand-delivered proposals or proposals submitted using an express mail or overnight courier service is: Initiative for Future Agriculture and Food Systems; c/o Proposal Services Unit; Cooperative State Research, Education, and Extension Service; U.S. Department of Agriculture; Room 303, Aerospace Center; 901 D Street, S.W.; Washington, D.C. 20024.

Proposals sent via the U.S. Postal Service must be sent to the following address: Initiative for Future Agriculture and Food Systems; c/o Proposal Services Unit; Cooperative State Research, Education, and Extension Service; U.S. Department of Agriculture; STOP 2245; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-2245.

C. Acknowledgment of Proposals

The receipt of proposals will be acknowledged by e-mail. Therefore, applicants are encouraged to provide e-mail addresses, where designated, on the Form CSREES-661. If the applicant's e-mail address is not indicated, CSREES will acknowledge receipt of the proposal by letter.

Once the proposal has been assigned an identification number, please cite that number on all future correspondence. If the applicant does not receive an acknowledgment within 60 days of the submission deadline, please contact the Program Director.

Part IV—Review Process

A. General

All proposals, including standard and consortia projects (as well as small and mid-sized designated projects), will be reviewed together by a panel in the pertinent program area. Prior to technical examination, a preliminary review will be made for responsiveness to the program area. Proposals that do not fall within the guidelines as stated in the Program Area Description will be eliminated from program competition and will be returned to the applicant.

Individual written comments and in-depth discussions will be provided by a peer review panel prior to recommending applications for funding. Peer review panel members will be selected based upon their training and experience in relevant scientific, extension, or education fields taking into account the following factors: (a) The level of formal scientific, technical education, and extension experience of

the individual, as well as the extent to which an individual is engaged in relevant research, education or extension activities; (b) the need to include as peer reviewers experts from various areas of specialization within relevant scientific, education, and extension fields; (c) the need to include as reviewers other experts (producers, range or forest managers/operators, consumers, etc.) who can assess relevance of the proposals to targeted audiences and to program needs; (d) the need to include as peer reviewers experts from a variety of organizational types (e.g., colleges, universities, industry, state and Federal agencies, private profit and non-profit organizations), and geographic locations; (e) the need to maintain a balanced composition of peer review groups with regard to minority and female representation and an equitable age distribution; and (f) the need to include members that can judge the effective usefulness to producers and the general public of each proposal.

B. Evaluation Factors

Priority will be given to projects that are multistate, multi-institutional, or multidisciplinary or projects that integrate agricultural research, education and extension.

The following evaluation factors apply to all proposals.

1. Relevance

All proposals will be judged as to their relevance to critical emerging agricultural issues related to future food production; environmental quality, and natural resource management; or farm income. Further factors include:

(a) Documentation that the research, extension and education activities are directed towards current or likely future problems or problems identified in this document;

(b) Evident linkage of research, extension and education functions.

(c) Evidence of involvement of stakeholders and/or communities of interest.

2. Merit

All proposals will be judged on their scientific, extension, or education merit including:

(a) Novelty, innovation, uniqueness, and originality;

(b) Conceptual adequacy of the research, extension and education components;

(c) Clarity and delineation of objectives;

(d) Adequacy of the description of the undertaking and suitability and feasibility of methodology;

(e) Demonstration of feasibility;
 (f) Probability of success of the project;

3. Quality

All proposals will be judged on their quality including:

- (a) Selection of most appropriate and qualified individuals to address the problem;
- (b) Training and demonstrated awareness of previous and alternative approaches to the problem identified in the proposal, and performance record or potential for future accomplishments;
- (c) Time allocated for systematic attainment of objectives;
- (d) Institutional experience and competence in subject area;
- (e) Adequacy of available or obtainable support personnel, facilities, and instrumentation;
- (f) Adequacy of plans for reporting, assessing and monitoring of results of the project over its duration.

Consortia: In addition to the evaluation factors listed above the consortia proposals will be judged on the adequacy of: The planned administration of the consortium and its maintenance, partnerships, collaborative efforts, evaluation and monitoring efforts, and the planned dissemination of information over the duration of the project.

C. Conflicts-of-Interest and Confidentiality

During the peer evaluation process, extreme care will be taken to prevent any actual or perceived conflicts-of-interest that may impact review or evaluation. For the purpose of determining conflicts-of-interest, the academic and administrative autonomy of an institution shall be determined by reference to the January 1998 issue of the Codebook for Compatible Statistical Reporting of Federal Support to Universities, Colleges, and Nonprofit Institutions, prepared by Quantum Research Corporation for the National Science Foundation.

Names of submitting institutions and individuals, as well as proposal content and peer evaluations, will be kept confidential, except to those involved in the review process, to the extent permitted by law. In addition, the identities of peer reviewers will remain confidential throughout the entire review process. Therefore, the names of reviewers will not be released to applicants. At the end of the fiscal year, names of panelists will be made available in such a way that the panelists cannot be identified with the review of any particular proposal.

Part V—Additional Information

A. Access To Review Information

Copies of summary reviews, not including the identify of reviewers, will be sent to the applicant PI/PD after the review process has been completed.

B. Grant Awards

(1) General

Within the limit of funds available for such purpose, the awarding official of CSREES shall make grants to those responsible, eligible applicants whose proposals are judged most meritorious under the procedures set forth in this RFP. The date specified by the Administrator as the effective date of the grant shall be no later than September 30. It should be noted that the project need not be initiated on the grant effective date, but as soon thereafter as practical so that project goals may be attained within the funded project period. All funds granted by CSREES under this RFP shall be expended solely for the purpose for which the funds are granted in accordance with the approved application and budget, the regulations, the terms and conditions of the award, the applicable Federal cost principles, and the Department's assistance regulations (parts 3015, 3016, and 3019 of 7 CFR).

(2) Organizational Management Information

Specific management information relating to an applicant shall be submitted on a one-time basis as part of the responsibility determination prior to the award of a grant identified under this RFP, if such information has not been provided previously under this or another CSREES program. CSREES will provide copies of forms recommended for use in fulfilling these requirements as part of the preaward process.

(3) Grant Award Document and Notice of Grant Award

The grant award document shall include at a minimum the following:

- (a) Legal name and address of performing organization or institution to whom the Administrator has awarded a grant under the terms of this request for proposals;
- (b) Title of project;
- (c) Name(s) and address(es) of principal investigator(s) chosen to direct and control approved activities;
- (d) Identifying grant number assigned by the Department;
- (e) Project period, specifying the amount of time the Department intends to support the project without requiring recompensation for funds;

(f) Total amount of Departmental financial assistance approved by the Administrator during the project period;

(g) Legal authority(ies) under which the grant is awarded;

(h) Approved budget plan for categorizing allocable project funds to accomplish the stated purpose of the grant award; and

(i) Other information or provisions deemed necessary by CSREES to carry out its respective granting activities or to accomplish the purpose of a particular grant.

The notice of grant award, in the form of a letter, will be prepared and will provide pertinent instructions or information to the grantee that is not included in the grant award document.

All grants awarded under this program will be awarded using a funding mechanism whereby CSREES agrees to support a specified level of effort for a predetermined time period without additional support at a future date.

C. Use of Funds; Changes

(1) Delegation of Fiscal Responsibility

Unless the terms and conditions of the grant state otherwise, the grantee may not in whole or in part delegate or transfer to another person, institution, or organization the responsibility for use or expenditure of grant funds.

(2) Changes in Project Plans

(a) The permissible changes by the grantee, PI/PD(s), or other key project personnel in the approved project grant shall be limited to changes in methodology, techniques, or other aspects of the project to expedite achievement of the project's approved goals. If the grantee and/or the PI/PD(s) are uncertain as to whether a change complies with this provision, the question must be referred to the CSREES Authorized Departmental Officer (ADO) for a final determination.

(b) Changes in approved goals or objectives shall be requested by the grantee and approved in writing by the CSREES ADO prior to effecting such changes. In no event shall requests for such changes be approved which are outside the scope of the original approved project.

(c) Changes in approved project leadership or the replacement or reassignment of other key project personnel shall be requested by the grantee and approved in writing by the awarding official of CSREES prior to effecting such changes.

(d) Transfers of actual performance of the substantive programmatic work in whole or in part and provisions for

payment of funds, whether or not Federal funds are involved, shall be requested by the grantee and approved in writing by the ADO prior to effecting such transfers, unless prescribed otherwise in the terms and conditions of the grant.

(e) Changes in Project Period: The project period may be extended by CSREES without additional financial support, for such additional period(s) as the ADO determines may be necessary to complete or fulfill the purposes of an approved project. Any extension of time shall be conditioned upon prior request by the grantee and approval in writing by the ADO, unless prescribed otherwise in the terms and conditions of a grant, but in no case shall a grant period of performance exceed 5 years.

(f) Changes in Approved Budget: Changes in an approved budget must be requested by the grantee and approved in writing by the ADO prior to instituting such changes if the revision will involve transfers or expenditures of amounts requiring prior approval as set forth in the applicable Federal cost principles, Departmental regulations, or in the grant award.

D. Applicable Federal Statutes and Regulations

Several other Federal statutes and regulations apply to grant proposals considered for review and to project grants awarded under this program. These include, but are not limited to:

7 CFR Part 1.1—USDA implementation of the Freedom of Information Act.

7 CFR Part 3—USDA implementation of OMB Circular No. A-129 regarding debt collection.

7 CFR Part 15, subpart A—USDA implementation of Title VI of the Civil Rights Act of 1964, as amended.

7 CFR Part 3015—USDA Uniform Federal Assistance Regulations, implementing OMB directives (i.e., Circular Nos. A-21 and A-122) and incorporating provisions of 31 U.S.C. 6301-6308 (formerly the Federal Grant and Cooperative Agreement Act of 1977, Pub. L. No. 95-224), as well as general policy requirements applicable to recipients of Departmental financial assistance.

7 CFR Part 3016—Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments.

7 CFR Part 3017—USDA implementation of Governmentwide Debarment and Suspension (Nonprocurement) and Governmentwide Requirements for Drug-Free Workplace (Grants).

7 CFR Part 3018—USDA implementation of Restrictions on Lobbying. Imposes prohibitions and requirements for disclosure and certification related to lobbying on recipients of Federal contracts, grants, cooperative agreements, and loans.

7 CFR Part 3019—USDA implementation of OMB Circular A-110, Uniform Administrative Requirements for Grants and Other Agreements With Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations.

7 CFR Part 3052—USDA implementation of OMB Circular No. A-133, Audits of States, Local Governments, and Non-profit Organizations.

7 CFR Part 3407—CSREES procedures to implement the National Environmental Policy Act of 1969, as amended.

29 U.S.C. 794 (section 504, Rehabilitation Act of 1973) and 7 CFR Part 15d (USDA implementation of statute)—prohibiting discrimination based upon physical or mental handicap in Federally assisted programs.

35 U.S.C. 200 *et seq.*—Bayh-Dole Act, controlling allocation of rights to inventions made by employees of small business firms and domestic nonprofit organizations, including universities, in Federally assisted programs (implementing regulations are contained in 37 CFR Part 401).

E. Confidential Aspects of Proposals and Awards

When a proposal results in a grant, it becomes a part of the record of CSREES transactions, available to the public upon specific request. Information that the Secretary determines to be of a confidential, privileged, or proprietary nature will be held in confidence to the extent permitted by law. Therefore, any information that the applicant wishes to have considered as confidential, privileged, or proprietary should be clearly marked within the proposal. The original copy of a proposal that does not result in a grant will be retained by the CSREES for a period of one year. Other copies will be destroyed. Such a proposal will be released only with the consent of the applicant or to the extent required by law. A proposal may be withdrawn at any time prior to the final action thereon.

F. Regulatory Information

For the reasons set forth in the final Rule-related Notice to 7 CFR part 3015, subpart V (48 FR 29115, June 24, 1983), this program is excluded from the scope of the Executive Order 12372 which requires intergovernmental consultation

with State and local officials. Under the provisions of the Paperwork Reduction Act of 1995, as amended (44 U.S.C. chapter 35), the collection of information requirements contained in this Notice have been approved under OMB Document No. 0524-0022.

Done at Washington, D.C., this 1st day of March 2000.

Charles W. Laughlin,

Administrator Cooperative State Research, Education, and Extension Service.

APPENDIX A—Most Successful Universities and Colleges for Receiving Federal and/or National Research Initiative Funds¹

Baylor College of Medicine
Boston University
Brown University
California Institute of Technology
Carnegie-Mellon University
Case Western Reserve University
Colorado State University
Columbia University
Cornell University
CUNY Mount Sinai School of Medicine
Dartmouth College
Duke University
Emory University
Florida State University
Georgetown University
Georgia Institute of Technology
Harvard University
Indiana University
Iowa State University of Science and Technology
Johns Hopkins University
*Kansas State University
Massachusetts Institute of Technology
Medical College of Wisconsin
Michigan State University
New York University
North Carolina State University
Northwestern University
Ohio State University

¹ Based on data from the table Federal obligations for science and engineering research and development to the 100 universities and colleges receiving the largest amounts, ranked by total amount received: in fiscal year 1997 of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (National Science Foundation, accessible through the Internet at www.nsf.gov/sbe/srs/nsf99331/).

* Annotated institutions are not in the list for the most successful Federally funded, but were among the top 50th percentile of those funded by the National Research Initiative (Competitive, Special, and Facilities Research Grant Act (7 U.S.C. 450i(b)) over the past three years (1997-1999).

¹ Based on data from the table Federal obligations for science and engineering research and development to the 100 universities and colleges receiving the largest amounts, ranked by total amount received: in fiscal year 1997 of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (National Science Foundation, accessible through the Internet at www.nsf.gov/sbe/srs/nsf99331/).

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Oregon Health Sciences University
 Oregon State University
 Pennsylvania State University
 Princeton University
 Purdue University
 Rockefeller University
 Rutgers, The State University of New Jersey
 Scripps Research Institute
 Stanford University
 State University of New York at Stony Brook
 State University of New York at Buffalo
 Texas A&M University, College Park
 Thomas Jefferson University
 Tufts University
 Tulane University
 University of Alabama Birmingham
 University of Arizona
 University of California Berkeley
 University of California Davis
 University of California Irvine
 University of California Los Angeles
 *University of California Riverside
 University of California San Francisco
 University of California Santa Barbara
 University of Chicago
 University of Cincinnati
 University of Colorado
 University of Florida
 University of Georgia
 University of Illinois Urbana-Champaign
 University of Illinois Chicago

¹ Based on data from the table Federal obligations for science and engineering research and development to the 100 universities and colleges receiving the largest amounts, ranked by total amount received: in fiscal year 1997 of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (National Science Foundation, accessible through the Internet at www.nsf.gov/sbe/srs/nsf99331/).

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University of Iowa
 University of Kansas
 University of Maryland Baltimore Prof Sch
 University of Maryland College Park
 University of Massachusetts Amherst
 University of Massachusetts Medical School
 Worcester
 University of Medicine and Dentistry of New Jersey
 University of Miami
 University of Michigan Ann Arbor
 University of Minnesota Twin Cities
 University of Missouri Columbia
 *University of Nebraska—Lincoln
 University of New Mexico
 University of North Carolina Chapel Hill
 University of Pennsylvania
 University of Pittsburgh
 University of Rochester
 University of South Carolina
 University of Southern California
 University of Texas at Austin
 University of Texas Health Science Center Houston
 University of Texas Health Sci. Center San Antonio
 University of Texas MD Anderson Cancer Center
 University of Texas Medical Branch Galveston
 University of Texas SW Medical Center Dallas

¹ Based on data from the table Federal obligations for science and engineering research and development to the 100 universities and colleges receiving the largest amounts, ranked by total amount received: in fiscal year 1997 of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (National Science Foundation, accessible through the Internet at www.nsf.gov/sbe/srs/nsf99331/).

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University of Utah
 University of Virginia
 University of Washington
 University of Wisconsin Madison
 *Utah State University
 Vanderbilt University
 Virginia Commonwealth University
 Wake Forest University
 Washington University
 *Washington State University
 Wayne State University
 Woods Hole Oceanographic Institute
 Yale University
 Yeshiva University, New York
 [FR Doc. 00–5349 Filed 3–1–00; 3:24 pm]

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