7.0 RESEARCH TOPIC DESCRIPTIONS AND INSTRUCTIONS

Applicants are encouraged to submit applications that address the research priorities stated for each topic area described in this Program Solicitation (see topic areas 8.1 through 8.13 below). They are further encouraged to submit applications related to agriculturally–related manufacturing technology, energy efficiency and alternative and renewable energy or one or more of the NIFA Societal Challenge Areas; see section 1.6. Applicants should pay attention to specific instructions located within each of the topic area descriptions when developing their proposal. Each topic area description provides background information, FY 2015 research priorities and other key information. Although applicants should apply to the topic area they deem most appropriate, USDA reserves the right to shift applications between topic areas when necessary to achieve the most effective review. Questions regarding the suitability of research for a specific topic area should be directed to the appropriate NPL.

7.1 Forests and Related Resources

Contact Dr. Charles Cleland, NPL for SBIR Forests and Related Resources at ccleland@nifa.usda.gov or (202) 401-6852 regarding questions about the topic area or to arrange a telephone consultation.

Background

The Forests and Related Resources topic area aims to address the health, diversity and productivity of the Nation's forests and grasslands to meet the needs of present and future generations through the development of environmentally sound approaches to increase productivity of forest lands, improve sustainability of forest resources, and develop value-added materials derived from woody resources. New technologies are needed to enhance the protection of the Nation's forested lands and forest resources and help to ensure the continued existence of healthy and productive forest ecosystems. Proposals focused on sustainable bioenergy and development of value-added biofuels from woody biomass, and on the influence of climate change on forest health and productivity are strongly encouraged. Proposals that utilize nanotechnology in their approach to developing new wood-based products or that utilize wood-based nano-materials are also encouraged.

To meet the identified needs in forestry and wood utilization, the program's long-term goals (10 years) are to achieve increased utilization of woody resources for value-added products from wood; healthy and sustainable forest ecosystems that are more resilient to wildfires and the impact of pathogens and insects; improved environmental and economic methods of sustainable harvesting; and improved growth and yield of forest species that will lead to more efficient use of forested lands.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to the following:**

1. **Growth and Yield –** Improving growing stock, tissue culture, genetic manipulation or vegetative reproduction of forest trees, and other means of increasing the regenerative abilities of forests; developing systems to increase the survival of newly planted trees through mechanical, physical or chemical means that are environmentally safe and through improved nutrient/water utilization; reducing the adverse impact of pathogens and insects by developing better methods to monitor infestations and improved control strategies for combating insects and pathogens that attack important woody species.

2. **Increasing the Utility of Forest-Grown Material –** Research to improve the yield of lumber, pulp fiber and specialty chemicals from trees; utilizing a greater percentage of the tree through improved techniques of production, for the creation of new or improved reconstituted products; developing better methods for manufacturing wood-based products and testing products for performance and durability; and developing improved methods for the production of paper.

3. **Reducing Ecological Damage by Forest Operations** – Research to reduce soil erosion, compaction, water degradation or other alterations caused by harvesting and/or other forest operations, provisions for the economic recovery of resources from forests while raising potential productivity and reducing impacts to the ecological structure of the area of operation.

4. **Urban forestry** – Research to promote the growth of forested land in urban areas, such as greenways, parks, and strategically planted urban trees, to address problems of forest fragmentation, the introduction of invasive species, and the impact of urban forested land on air and water quality and quality of life improvements.

5. **Climate Change –** Research to address the issue of ecosystem adaptation to climate change, ways to enhance carbon sequestration and reduction in greenhouse gas emissions, development of decision support tools for forest managers and markets for forest ecosystem services.

6. **Developing Technology that Facilitates the Management of Wildfires on Forest Lands –** Research that provides systems for detecting and managing wildfires; systems for reducing fuel loads in forests; tools and equipment for improving the efficacy and safety of fire fighters on the ground and in the air; and communication and navigation systems for improving the coordination of fire management activities.

7. **Sustainable Bioenergy and Development of Value-Added Products From Forest Resources** – Research for development of improved methods for the conversion of forest biomass into cellulosic biofuels (e.g. ethanol, biobutanol, jet aviation) and biobased products, including intermediate chemicals; development of new wood-based composite materials; development of local scale energy conversion projects that generate electricity and/or useful heat; and development of technologies that will mitigate carbon release from combustion.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact the NPL regarding the suitability of research topics.

- Applications that deal with the development of biofuels derived from non-woody agricultural crops should be submitted under topic area 8.8 Biofuels and Biobased Products.

7.2 Plant Production and Protection - Biology

Contact Dr. Shing Kwok, NPL for SBIR Plant Production and Protection - Biology at skwok@nifa.usda.gov or (202) 401-6060 regarding questions about the topic area or to arrange a telephone consultation.

Background

The objective of this topic area is to examine means of enhancing crop production by applying biological approaches to reduce the impact of harmful agents, develop new methods for plant improvement, and apply traditional plant breeding methods and new technologies to develop new food and non-food crop plants, as well as new genotypes of existing crop plants with characteristics that allow their use in new commercial applications. This topic area supports the following NIFA Societal Challenge Areas: Global Food Security and Hunger; Climate Change; Sustainable bioenergy; and Food Safety.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to the following:**

1. **Plant improvement –** Improved crop production using traditional plant breeding and biotechnology, including but not limited to, molecular biology, and mutagenesis, genomics, tissue culture, and/or embryogenesis to produce crops with new or improved quality, yield, agronomic, horticultural, value- added, and/or economic traits. Topics may include, but not limited to:

   a. Improvement of commercial floriculture production - Biological and/or technological approaches to improve the competitiveness of U.S. production of flowering potted plants, bedding plants, seasonal crops, annuals, perennials, and cut flowers.
   b. Development of new crops – Development of new crop plants as sources of food, non-food industrial or ornamental products.

2. **Pollinators and crop production** - Projects that address the health and success of domesticated and natural pollinators of economically important crops.

3. **Pollinators and crop production** - Projects that address the health and success of domesticated and natural pollinators of economically important crops.

4. **Plant protection against abiotic and/or biotic stresses –** Reduced the impact of plant pathogens, insect pests, and abiotic stress on crop plants; and increasing plant resistance to plant pathogens, insect pests, and abiotic stress. Topics may include, but not limited to:
   a. Improved plant disease diagnostics (accurate, rapid, and cost-effective identification of causal agents in specialty crop plants at the earliest possible time relative to manifestation of disease).
   b. Bio-Based approaches to protect organically-grown crops from insect and nematode pests and diseases, including the development of decision aid systems that are information extensive and time sensitive.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- Phase I applications involving the development of transgenic crops would benefit by the inclusion of a brief description of the proposed path to commercialization, including an understanding of what will be needed to clear regulatory consideration. Phase II applications involving the development of transgenic crops should have an expanded section on how regulatory considerations will be met and market entry attained.

- Applications that deal with non-biological engineering technologies should be sent to topic area 8.13 Plant Production and Protection-Engineering.

- Applications that deal with the genetic improvement and production of woody biomass feedstock crops should be submitted to the 8.1 Forest and Related Resources topic area.

- Applications that deal with the genetic improvement and production of algae should be submitted to the 8.7 Aquaculture topic area.

7.3 Animal Production and Protection

Contact Dr. Robert Smith, NPL for SBIR Animal Production and Protection atrsmith@nifa.usda.gov or (202) 401-4892 regarding questions about the topic area or to arrange a telephone consultation.

Background

The Food and Agriculture Organization (FAO) of the United Nations predicts that feeding the world's growing population will require a doubling of global food production by 2050. Fulfilling this need will require new technologies to improve both productivity and efficiency of food animals. The Animal Production and Protection topic area aims to develop innovative, marketable technologies that will provide significant benefit to the production and protection of agricultural animals. New technologies for rapid detection, treatment and prevention of disease are needed to improve productivity and enhance the biosecurity of our herds and flocks. Better technologies are also needed to trace animals as they move through the food supply chain and to ensure that food products derived from animals do not contribute to food-borne illnesses. To meet increasing consumer demand for value-added animal products, innovative technologies are needed to address the challenges presented by non-conventional management systems and strategies. And there is an urgent need for technologies that decrease the impact of animal agriculture on the environment and optimize use of our natural resources. Technological advances in animal production and protection will not only enhance the safety of the Nation's food supply and contribute to environmental stewardship, they will also allow American producers to remain competitive in the global marketplace and contribute to global food security.

FY 2015 Research Priorities:

Development of marketable technologies designed for use in agriculturally important animals that will:

1. Improve production efficiency. Areas of interest include improved fertility; increased feed efficiency; and translation of genomic information into practical use and benefit.

2. Improve the safety and/or quality of end products derived from animals. These technologies must be applicable in the pre-harvest environment.

3. Improve animal health and well-being. Examples of these technologies include new diagnostics, therapeutics, vaccines and other immunization methods, biosecurity management tools, traceability methods, and animal handling methods.

4. Improve the productivity of animals in modified conventional or alternative animal production systems. Examples include non-confinement housing, pasture-based feeding systems, and organic systems.

5. Mitigate the impacts of animal agriculture on the natural environment. Areas of interest include technologies that decrease greenhouse gas emissions or reduce the excretion of phosphorus and nitrogen.

Other Key Information

- Applications that deal with post-harvest technologies for products derived from animals will not be accepted for review under this program area. Applications that deal with post-harvest technologies

for foods derived from animals may be submitted under topic area 8.5 Food Science and Nutrition.

- Applications should explain how the proposed work will contribute to the USDA Societal Challenge Areas (Global Food Security and Hunger, Climate Change, Food Safety).

- All Phase I applications should give the reviewers a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- Applications dealing with aquacultured species should be submitted under topic area 8.7 Aquaculture.

7.4 Air, Water and Soils

Contact Mary Ann Rozum, NPL for SBIR Air, Water and Soils at mrozum@nifa.usda.gov or (202) 401-4533 regarding questions about the topic area or to arrange a telephone consultation.

Background

The Air, Water and Soils topic area aims to develop technologies for conserving and protecting air, water and soil resources while sustaining optimal farm and forest productivity. Climate variability and food security are major focal points of this topic area. Efforts are needed to reduce the production of greenhouse gases that result from agricultural activities and to increase carbon sequestration in soils. Climate change is likely to alter temperature and precipitation patterns and new technologies are needed that will better enable plant and animal production systems to adapt to changing climatic conditions. As population continues to increase food security will be critical as efforts for food production to keep pace will increasingly become a challenge. Soil and water are critical resources that impact food production. New technologies are needed that will improve water quality and conservation and use water more efficiently. We also need new technologies that will improve soil quality and fertility and reduce soil erosion.

To meet these identified needs of agriculture, the program's long-term goals (10 years) are to achieve improved air quality and improved utilization of water resources that are better able to sustain production agriculture; better use of limited water resources for agriculture through improved irrigation technologies; a more sustained soil resource through reduced soil erosion and thereby lead to more productive agriculture; and improved soil quality that will permit a more sustainable and productive agriculture.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to, the following:**

1. **Water Quality and Conservation –** Develop new and improved technologies to optimize water management conservation at both the farm level and at a watershed scale, monitor the quality of surface water and groundwater resources for biotic and abiotic pollutants, including animal manure and pharmaceuticals, develop improved methods for the reuse of waste water, including the remediation and restoration of water resources that impact agriculture and forestry operations, and promote watershed restoration.

2. **Irrigation –** Develop improved irrigation technologies for both farming and landscaping applications that will provide more efficient and cost-effective delivery of water and chemicals. Develop new irrigation methods that allow for more efficient use of water including accurate delivery of water to where it is needed.

3. **Soil Erosion** – Develop better methods for preventing soil erosion by wind and surface water runoff and for monitoring wind erosion and sediment transport.

4. **Soil Quality** – Develop new technologies for measuring soil properties, soil nutrient content, and the physical and chemical nature of soil. Research new technologies that enhance soil properties

while restricting adverse environmental impact and develop improved methods to remediate degraded soils.

5. **Air Resources** – Develop new and improved technologies to monitor air quality and reduce air pollution stemming from agricultural enterprises, including manures from livestock and poultry production systems.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact the NPL regarding the suitability of research topics.

7.5 Food Science and Nutrition

Contact Dr. Jodi Williams, NPL for SBIR Food Science and Nutrition at jwilliams@nifa.usda.gov or (202) 720-6145 regarding questions about the topic area or to arrange a telephone consultation.

Background

The Food Science and Nutrition topic area aims to fund projects that support research focusing on developing new and improved processes, technologies, or services that address emerging food safety, food processing and nutrition issues.. The program will fund projects: 1) Increase the understanding of the physical, chemical, and biological characteristics of food; 2) Improve methods for the processing and packaging of food products to improve the quality and nutritional value of foods; and 3) Develop programs or products that increase the consumption of healthy foods and reduce childhood obesity. The outcome of a successful project is a proof of concept for a marketable item or patented process.

The long term goals (10 years) of the program are to commercialize the production of useful new food products, processes, materials, and systems that reduce food-borne illness, obesity and enhance the nutritional quality and value of foods.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include, **but are not limited to, the following:**

1. **Food Safety:** Developing technologies for the rapid detection of food borne hazards (microorganisms, chemicals, toxins) during pre- and post-harvest processing and distribution.

2. **Food- Quality-Engineering:** Developing innovative food processing and packaging technologies and materials that reduce post-harvest losses in produce while maintaining safety and quality.

3. **Food Quality- Science:** Understanding the physical, biological, and chemical interactions and functionality of food in order to develop affordable food ingredients and/or food formulations that contribute to the development of high quality foods.

4. **Nutrition – Education:** Developing and implementing interactive programs for nutrition educators and teachers to increase nutrition awareness and improve health to address obesity among children.

5. **Nutrition- Science:** Improve functionality and efficacy of foods, nutrients and/or dietary bioactive components in promoting health.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact the NPL regarding the suitability of research topics.

- Improvements of current commercial methods should address high false positive and high false negative rates associated with PCR based methods for detection of food borne bacteria in produce and high false negative rates associated with immunoassays for detection of Salmonella.

- New rapid detect tests should be designed to detect at least 1 cfu/25g of food using approaches that reduce or eliminate enrichment and should be designed to allow for sampling of large volumes of food.

- Projects that promote value-added products and processes are encouraged.

- Projects that address functional foods to promote health are encouraged.

- Projects on novel screening methods for threat agents need strong letters of support from the appropriate Federal agency that will be the end user of the technology.

- Projects that focus on technologies for improving cost benefit and model-based analyses, including distribution, warehousing, and retailing systems as they relate to the economy are acceptable.

- Applicants who have received previous SBIR funding should address outcomes for those projects.

Projects should include appropriate collaborations with experts in the field of investigation i.e. a Food Scientist or Nutritionist as a part of the development team for the project.

7.6 Rural and Community Development

Mr. Brent Elrod, National Program Leader for SBIR Rural Development may be contacted at belrod@nifa.usda.gov or (202) 690-3468 6145 regarding questions about the topic area or to arrange a telephone consultation.

Background

During the last 30 years, dramatic social, economic and technological changes have occurred in many rural areas in the United States. Although farming continues to be an important source of income, most of rural America is moving from an agrarian to a post-agrarian economy. The results of this transformation have been uneven across the rural landscape. Some communities are facing economic decline and rural exodus, while in other communities, especially those in areas near large urban centers or rich in natural amenities, economic and population growth have accelerated. Even in rural communities where economic growth and population have grown, some have become more vulnerable to disasters caused by human action and/or climate changes. Many other communities are plagued by limited access to good schools, food, and health services. As a result, despite decades of intervention and billions of dollars in public investment, many rural residents are unable to utilize important government services and new scientific information that can help improve their quality of life; have higher food insecurity and childhood obesity rates; lack the required entrepreneurship and workforce skills to take advantage of emerging economic opportunities (e.g., climate change mitigation, safe food processing and marketing, etc); and are hampered by insufficient modern infrastructure to rapidly benefit from growing public and private sector investment.

Applications may be submitted for the development of new technology, or for the utilization of existing technology, that address important economic and social development issues or problems in rural America. The applications need not be centered on agriculture, but may be focused on any area that has the potential to provide significant benefits to rural Americans. All applications should explicitly discuss the specific rural problem or opportunity that will be examined and how this technology will successfully address the problem or opportunity. Applications submitted must include an objective to assess the impacts of the proposed project on the environment or the socio-economic development of rural areas.

To meet these identified problems and opportunities of rural development, the long-term (10 year) goal for this program is to develop and commercialize new technology, products, processes and services that will: (i) enhance the efficiency and equity of public and private investment in rural communities; (ii) build a diversified workforce to meet the needs of the present and for the future; (iii) enhance resilience to both natural and human disasters; and (iv) enhance economic vitality of rural communities and, in turn, reduce rural poverty.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to, the following:**

1. **Development of services and information and managerial systems that improve the efficiency and effectiveness of Local Governments and Public and Private Institutions.** Topics may include educational programs that address the specific needs of people in rural areas (e.g., development of entrepreneurship and workforce skills); new housing designs; improved health care delivery; appropriate transportation and communication technologies and services;

and marketing of new information and technologies.

2. **Development of technologies and services that protect or enhance the environment while promoting economic development**. Topics may include technologies and services that protect the ecosystem, conserve energy, develop alternative energy sources such as wind and solar energy (excluding biofuels), etc.

3. **Reducing the vulnerabilities of rural communities from hazards (excluding intentional acts such as terrorism).** Procedures are needed to make rural communities more sustainable to natural or unintentional hazards such as food-borne illnesses, food contamination, droughts, hurricanes, etc., through better preparation, forecast and warning, response and rebuilding phases of hazard mitigation, including communication.

4. **Development of technologies and services that specifically address the needs of youth and, the elderly the low-income sector of the rural population.** Efforts are needed that will enhance human capital development, build earnings capacity, promote food security, including issues of access to adequate amounts and quality of foods, increase labor force participation and/or promote job creation to the most vulnerable populations in rural communities.

5. **Increasing opportunities for employment and income generation in rural communities.** Topics may include rural tourism, agri-tourism, off-farm value-added agricultural development, etc.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact the NPL regarding the suitability of research topics.

- If funded, projects are expected to enhance the environmental and economic vitality of rural communities. Therefore, applications must contain an objective to assess the impacts of the proposed project on the environment or the socio-economic development of rural areas.

- Applications dealing with on-farm production agriculture research should be submitted to topic area 8.12 Small and Medium Sized Farms.

- Applications dealing with the development of biofuels and biobased products should be submitted to topic area 8.8 Biofuels and Biobased Products.

7.7 Aquaculture

Investigators with questions regarding questions about the topic area may contact Dr. Charles Cleland, NPL for SBIR Aquaculture at ccleland@nifa.usda.gov, (202) 401-6852.

Background

The Aquaculture topic area aims to develop new technologies that will enhance the knowledge and technology base necessary for the expansion of the domestic aquaculture industry as a form of production agriculture. Seafood production from the wild is under increased pressure due to overfishing and pollution and therefore aquaculture is increasingly an important source of farmed seafood and an important contributor to improve food security. In this context new technologies are needed to protect aquaculture species against disease and to improve production efficiency. Emphasis is placed on research leading to improved production efficiency and increased competitiveness of private sector aquaculture in the United States. Studies on commercially important, or potentially important, species of fish, shellfish and plants from both freshwater and marine environments are included. Food Safety is another important priority in Aquaculture. Technologies are needed to ensure the safety of aquaculture species from heavy metals and other hazardous materials and from human pathogens.

To meet these identified needs in aquaculture, the program's long-term goals (10 years) are to achieve improved aquaculture production resulting from improved reproductive efficiency in fish and shellfish; improved aquaculture production resulting from genetic improvement in fish and shellfish; improved aquaculture production resulting from improved animal health; improved aquaculture production with reduced water usage and improved production efficiencies; and cost-effective production of microalgae for use as aquaculture feed and as a source of valuable human food supplements.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to, the following:**

1. **Reproductive Efficiency** – Novel or innovative approaches to improve reproductive efficiency in aquaculture species including: greater control of maturation, ovulation and fertilization; improved gamete and embryo storage; improved larval rearing techniques; enhanced reproductive performance of broodstock; improved methods for cryopreservation of sperm and embryos; and methods to control sex determination.

2. **Genetic Improvement** – Novel or innovative approaches to improve production efficiency through genetic improvement of aquacultural stocks including: genetic mechanisms of sex determination; genetic basis for inheritance of commercially important traits, such as growth, cold tolerance, and pathogen susceptibility; identification of major genes affecting performance; application of molecular biology and genomics and the integration of this technology into breeding programs; and performance evaluation of aquacultural stocks and utilization of crossbreeding and hybridization.

3. **Integrated Aquatic Animal Health Management** – Novel or innovative approaches to reducing acute and chronic losses related to aquatic animal health in aquaculture production systems through an integrated holistic approach including: physiological stress related to the quality of the

aquatic production system; genetic, environmental, and nutritional components of aquatic health management; control of predation in aquaculture production systems; development of new vaccines or immunization procedures to enhance resistance to infectious diseases and parasites; development of diagnostic tests for specific diseases that pose a health hazard; and development of improved treatment methods for acute or chronic health problems caused by specific infectious or non- infectious agents, parasites, injuries and chemical and toxic agents.

4. **Improved Production Systems and Management Strategies** – Novel or innovative approaches to improve existing or alternative production system design and management strategies including: development of biological, engineering and economic design criteria and models; enhancement of water quality in existing production systems through aeration, flow patterns, etc.; characterization, handling and treatment of effluent from aquacultural production systems; improved harvesting methods and strategies; and improved operating efficiencies for recirculation systems.

5. **Plant Production Systems** – Novel or innovative approaches to improve the efficiency of algal production systems including: identification of new species with improved nutritional profile for use in feeding to other aquacultural species or as a source of valuable human food supplements; development of improved bioreactor technology; and development of better methods for harvesting algal biomass.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact either NPL regarding the suitability of research topics.

- Applications that deal with the development of new food products derived from aquaculture species should be submitted under topic area 8.5 Food Science and Nutrition.

7.8 Biofuels and Biobased Products

Contact Dr. William Goldner, NPL for SBIR Biofuels and Biobased Products at wgoldner@nifa.usda.gov or (202)-401-1719 regarding questions about the topic area or to arrange a telephone consultation.

Background

The objective of this topic area is to promote the use of biofuels and non-food biobased products by developing new or improved technologies that will lead to increased production of industrial products from agricultural materials. This research will lead to new opportunities to diversify agriculture and enhance agriculture's role as a reliable supplier of raw materials to industry. This topic area supports the NIFA Sustainable Bioenergy Societal Challenge Area and the Climate Change Societal Challenge Area. Historically, appropriate research areas have included: development of procedures for enhanced recovery of critical raw materials from agricultural commodities; development of improved technology for converting agriculturally derived raw materials into useful industrial products; development of new products from new industrial crops; and development of industrial products derived from agricultural materials to make them more effective and/or more cost competitive with non-agriculturally derived industrial products. In order to enhance the impact of the program, acceptance of applications will be limited to select Research Priority Areas.

FY2015 Priority Research Areas

Acceptance of applications for the FY2015 solicitation will be **strictly limited** to:

1. **Advanced "Drop-in" Biofuels** – New and improved technology for the **economically and environmentally sustainable** production and conversion of agricultural biomass material **energy crops and residues** into non-ethanol biofuels (e. g. biobutanol, green gasoline, green diesel, aviation fuel), fuel additives, and other products to be used as fuel; development of improved biocatalysts and thermochemical processes for advanced biofuel production, and byproducts from the advanced biofuel production stream that will optimize the economic feasibility of the production of biofuels. This solicitation seeks to support innovative technologies that will minimize adverse environmental impacts during conversion (for example: reduction of energy use and water use during conversion; reduction of harmful byproducts from conversion) and have carbon reduction benefits. Applications developing technology for ethanol production (grain or cellulosic) or co-products from ethanol production will not be accepted in this topic area, but may be submitted to other topic areas if appropriate (see Other Key Information below). Applications not addressing economic and environmental sustainability may be returned to the applicant without review.

2. Advanced biofuels and biobased products from **animal manure** or carcass waste.

3. **New Non-food Biobased Products from New Industrial Crops** – Identification of markets and development of new biobased products and processes for making products from new industrial crops (including algae). These products should be economically competitive and have carbon reduction benefits.

4. New processes for the manufacture of **biobased plastics**.

5. New products or processes that develop **biobased materials** with properties **that enhance energy efficiency** in their applications.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- Applications that deal with developing value-added biofuels (including ethanol) and biobased products from forest biomass should be sent to the 8.1 Forest and Related Resources topic area.

- Applications that deal with developing biofuels (including ethanol) and bioenergy that will improve the sustainability of small and mid-size farms should be sent to the 8.12 Small and Mid-Size Farms topic area.

- Applications that deal with the genetic improvement or production of biomass feedstock crops except for woody biomass and algae should be submitted to the 8.2 Plant Production and Protection– Biology topic area.

- Applications that deal with the genetic improvement, production, or feedstock logistics of woody biomass feedstock crops should be submitted to the 8.1 Forest and Related Resources topic area.

- Applications that deal with the genetic improvement, production, or feedstock logistics of algae for biofuel production should be submitted to the 8.7 Aquaculture topic area.

- Applications that deal with the engineering aspects of the planting, production or post-harvest handling of biomass feedstock crops should be submitted to the 8.13 Plant Production and Protection – Engineering topic area.

- Applications submitted to this topic area that do not specifically address the FY2015 Priority Research Areas will not be reviewed.

7.9 through 7.11 Reserved.

7.12 Small and Mid-Size Farms

Dr. Denis Ebodaghe, National Program Leader for SBIR Small and Mid-Size Farms may be contacted at debodaghe@nifa.usda.gov or (202) 401-438 regarding questions about the topic area or to arrange a telephone consultation.

Background

The Small and Mid-Size Farms topic area aims to promote and improve the sustainability and profitability of small and mid-size farms and ranches (where annual sales of agricultural products are less than $250,000 for small farms and $500,000 for mid-size farms - hereafter referred to as small farms). The vast majority of farms in this country are small and they play an important role in the agricultural sector. The viability and sustainability of small farms is important to the Nation's economy and to the stewardship of our biological and natural resources. While some small farms are located in urban areas, most small farms are located in rural areas, and these farms are critical to sustaining and strengthening the leadership and social fabric of rural communities. Applicants are strongly encouraged to emphasize how their project would contribute to the well-being of rural communities and institutions. In particular, applicants should emphasize how the results of their project would be disseminated to other small farmers and provide benefit to the small farm community.

Food safety, climate change, food security and sustainable bioenergy diversification of agricultural production systems and increased efficiency of farm operations and economies of scale are all important program priorities in this topic area. Proposals are encouraged that focus on one or more of these priorities and are appropriately scaled so as to apply to the needs and capabilities of small farmers.

To meet these identified needs in the small and mid-size farm sector, the program's long-term goals (10 years) are to achieve improvements in sustainability and profitability of small farms with increased production of specialty crops and specialty animals; improved farm management skills in small farmers that leads to more sustainable and profitable small farms; better stewardship of natural resources through adoption of more sustainable farming practices; enhanced utilization of renewable energy sources and more focus on energy efficiency and energy conservation; and better educated small farmers who are better able to operate their farms on a sustainable and profitable basis.

FY 2015 Research Priorities:

Examples of appropriate subtopics for research applications from small businesses include**, but are not limited to, the following:**

1. **New Agricultural Enterprises** – Efforts are needed to develop new agricultural enterprises that are small scale and focused on specialty farm products, both plant and animal, and on innovative ways to market these farm products through direct marketing, such as farmer's markets or cooperatives where the financial return to the farmer is optimized or through specialty market outlets that offer a higher financial return. Emphasis is encouraged for organic and natural foods, specialty animal products, such as free-range poultry or natural beef, non-food specialty crops, such as medicinal herbs and value-added food, and non-food products.

2. **Development of New Marketing Strategies –** Efforts are needed to develop appropriate new strategies for marketing agricultural, forestry and aquacultural commodities and value-added products produced by small farms in local, regional, national and international markets, including the assessment of consumer demand; identification of desired product characteristics, including packaging and processing methods; development of new and innovative utilization of existing production and processing technologies; and the promotion of efficient assembling, packing, processing, advertising and shipping methods.

3. **Farm Management** – Efforts are needed to develop tools and skills that are appropriate for small farms that will enhance the efficiency and profitability of small farms. New tools are also needed that will enhance farm safety. Development of new risk management tools to facilitate better planning is needed. Development of improved farm level life-cycle assessment tools that help small to mid-sized farms 1) improve operations through resource efficiency and 2) quantify ecosystem services provided is needed. Innovative ways to promote agro-tourism as a way to enhance farm profitability is encouraged.

4. **Natural Resources and Renewable Energy** – Efforts are needed to develop farming methods scaled appropriately for small farms that are directed at more efficient use of natural resources. Particular emphasis is needed to develop better ways to utilize renewable energy sources, such as wind, solar, and geothermal energy, and to promote improved energy efficiency and conservation in farming operations.

5. **Educational Outreach** – Efforts are needed to develop new tools to ensure that the next generation of small farmers has access to the information and resources they need to operate their small farms on a sustainable and profitable basis.

6. **Urban Farming** – In recent years there has been increasing interest in the establishment of small farms in urban areas on roof tops, in abandoned building and in vacant lots. Efforts are needed to explore ways to make urban farming more energy efficient, environmentally sustainable and profitable. The most appropriate crops for urban farms needs to be determined. Procedures that would increase the establishment of new urban farms need to be developed.

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- The applicants are strongly encouraged to contact the NPL regarding the suitability of research topic.

7.13 Plant Production and Protection - Engineering

Investigators are encouraged to contact Dr. Kitty Cardwell, National Program Leader for SBIR Plant Production and Protection Engineering may be contacted at kcardwell@nifa.usda.gov or 202-401-1790 regarding questions about the suitability of research topics or to arrange a telephone consultation.

Background

The objective of this topic area is to enhance crop production by creating and commercializing technologies that enhance system efficiency and profitability and that protect crops from pests and pathogens in economically and environmentally sound ways. Projects that promote energy conservation or efficiency are strongly encouraged. Examples of appropriate subtopics for research applications from small businesses include, **but are not limited to, the following:**

1. **Improved crop production methods or strategies –** Enhance the efficiency of crop production by utilizing innovative methods and equipment for planting, growing and harvesting crop plants, including optimization of inputs and reduction of environmental impacts by implementing the use of precision farming technology, robotics, sensors, information technology, and remote sensing, etc..

2. **Plant protection –** Reduce the impact of plant pathogens, insect pests and competing vegetation on crop plants by developing efficient and environmentally safe pesticide and herbicide application equipment, and by developing needed technologies to monitor and manage plant disease, insect pests, or abiotic stress at the earliest stages of their manifestations.

3. **Energy conservation –** Develop crop management systems, farm and greenhouse structures, and waste utilization strategies that promote energy conservation and efficiency, including the development of technology for the economic use of alternative/renewable energy resources.

Special Priority Research Areas for FY 2015: SBIR is strongly encouraging the submission of applications focusing on the following problem areas. Additional consideration will be given to applications addressing the development of products, processes, and services for US production of specialty crops (fruits, nuts, vegetables, nursery, and greenhouse crops):

1. **Improved chemical application technology** that increases product efficacy, worker safety, and reduces off-target drift of applied chemicals.

2. **High resolution spatial and temporal monitoring** of specialty crops using sensors and sensor networks (for example, temperature, humidity, drought stress, pest damage, and disease).

3. **Post-harvest handling (including transportation and storage) of specialty crops,** including handling to maintain quality and reduce food safety issues, reducing waste streams from post- harvest handling, selection for quality and consumer preference.

4. **Reduction of manual labor in specialty crop production, harvesting, and post-harvest handling** through technology to improve the competitiveness of US specialty crop

production.

5. **Technologies that enhance commercial hortiiculture production** to improve the competitiveness of U.S. flowering potted plant, bedding plant, and cut flower production, seasonal crops, annuals, and perennials.

6. **Planting, production, harvesting, and post-harvest handling technology** targeting the sustainable production of the following **biomass feedstock crop groups: perennial grasses, energycane, sorghum, and oil seed crops** (not including algae, see Other Key Information below).

7. **Technology to enhance the competitiveness of U.S. Organic agriculture and horticulture.**

Other Key Information

- All Phase I applications should give the reviewing community a brief vision of where the PD expects the project to be at the end of Phase II (entering Phase III commercialization).

- Applications that deal with irrigation and related technology should be sent to the 8.4 Soil and Water Resources topic area.

- Applications that deal with the feedstock logistics of woody biomass (including short rotation crops like willow and poplar) should be submitted to the 8.1 Forest and Related Resources topic area.

- Applications that deal with the production of algae for biofuel production should be submitted to the 8.7 Aquaculture topic area.

8.0 SAMPLE APPLICATIONS FROM USDA SBIR SOLICITATION

These applications, which resulted in Phase I awards, were submitted under previous USDA SBIR Program Solicitation guidelines. As such, these applications do not accurately reflect the current format nor the forms and attachments that are required for submission through Grants.gov. These applications are provided solely as samples for general guidance. In the original application, the cover page was signed by both the PD and AR. Social security numbers, budgets, and some material containing biographical information were removed to protect confidentiality.

Visit the following web page to see the sample applications available only in PDF version at: www.nifa.usda.gov/funding/sbir/sbir_sample.html.