

Draft Reporting Template on Agency Biomass R11/10/2006 Investments and Progress in Achieving Goals

I. Feedstock Production						
A. Biotechnology and Plant Physiology						
Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops						
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Agricultural Research Service (ARS)	<ul style="list-style-type: none"> Improve technology for genetic modification of feedstock plants. 	<ul style="list-style-type: none"> Devise molecular strategies for developing transgenic plants that retain yield and quality characteristics despite adverse environmental conditions. <ul style="list-style-type: none"> Develop plant quality evaluation methods, alfalfa germplasm, and environmentally beneficial crop management strategies for producing alfalfa as a perennial herbaceous biofuel feedstock. Determine the mechanisms that regulate starch biosynthesis and determine the effects of environment on grain development. Genetic enhance and manage warm-season grass species for biomass feedstock production. 			FY2003	
					FY2004	
					FY2005	
	<p>The bulk of ARS research on biobased products is conducted under ARS National Program 306, Quality and Utilization of Agricultural Products. The Program's mission is "To enhance the economic viability and competitiveness or otherwise enhancing their marketability, meeting consumer needs, developing environmentally friendly and efficient processing concepts, and expanding domestic and global market opportunities through the development fo value-added food and nonfood products and processes."</p>	<ul style="list-style-type: none"> Identify and characterize functional compounds and components in agricultural commodities and their byproducts. <ul style="list-style-type: none"> Improve understanding of the relationship between composition, molecular structure, and physical state and end-use functionality of these compounds and components. Use new knowledge of product properties and component interactions to develop functional intermediates or products. Identify and characterize by-product components for potential value-added products. Convert low value agricultural residues into higher value products. Develop improve and new techniques and technologies to convert agricultural products into value-added biobased products. Improve/develop processes and technologies that are environmentally benign. 		Western & Southern Regional Research Centers (Albany, CA and New Orleans, LA)	FY2003	\$1,396,300
					FY2004	\$1,411,600
					FY2005	\$1,417,200

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<p align="center">Cooperative State Research Education and Extension Service (CSREES)</p>	Identify and characterize suitable feedstocks with significant commercial potential for production of products and energy	Characterize biochemical pathways and genetically manipulate crops and forestry materials for desired traits	established relationships between pressure gradients and flow rates in wood; new and improved analytical methods based on non-degrading dissolution for NMR of wood fibers; genetic constructs for enhanced accumulation of transgenes from jojoba to soybeans and rape.	Academia	FY2003	\$532,000
					FY2004	\$661,000
					FY2005	\$1,169,000
	Develop lignocellulosic materials as feedstock for production of ETOH and chemicals	overcome recalcitrance of lignocellulosic biomass	progress in proteomic studies to determine bacterial tolerance/sensitivity to ethanol; progress in characterizing the "ecology" of anaerobic digestion; development of lignin blockers for pretreated cellulosic biomass; progress in evaluating the use of transgenic trees as feedstock for ETOH production; development of recombinant yeast that can ferment other cellulosic biomass sugars as well as xylose; production of recombinant procollagen in transgenic barley; production of cellulases in transgenic alfalfa	Academia	FY2003	\$2,073,000
					FY2004	\$2,862,000
					FY2005	\$3,211,000
	Develop new nonfood uses for agricultural raw materials and wastes, and forestry materials	Develop more efficient conversion technologies	use of feather fiber in filtration media and use of feather protein as polymeric raw material for fibers and films; progress in production of pyruvate and alanine by fermentation; development of fish skin as novel source of blood anticoagulant; progress in genetic manipulation of micorbes to produce emulsifiers and surfactants	Academia	FY2003	\$3,618,000
					FY2004	\$2,009,000
					FY2005	\$6,748,000

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Forest Service (FS)	Understand fundamental wood structure and effecting factors and mechanisms	develop biological pathways and genomic information on candidate forest species	quantification of genetics-silviculture interactions for effective biomass feedstock production; providing pedigreed populations of poplar for mapping poplar genome	USDA Forest Service North Central Research Station in partnership with DOE	FY2003	
					FY2004	\$400,000
					FY2005	\$400,000
Natural Resources Conservation Service (NRCS)	Biomass feedstocks having significant commercial potential for production of bioenergy, biofuels, and biobased products.	Overcoming economic barriers and indentifying appropriate agronomic and silvicultural methods for sustainable feedstock production from agricultural products, by-products and forest residues.	Two projects funded. No results to report. Projects not completed as of this date.		FY2003	
					FY2004	
					FY2005	\$1,363,451

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I. Feedstock Production						
A. Biotechnology and Plant Physiology						
Objective Two - Develop the chemical and chemical/biological pathways necessary to improve the energy density and chemical characteristics of delivered feedstocks.						
Roadmap Main Category Sub-Category & Focus	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Agricultural Research Service (ARS)	<ul style="list-style-type: none"> Improve technology for genetic modification of feedstock plants. 	<ul style="list-style-type: none"> Understanding the mechanisms controlling grass biomass yield and quality. Devising molecular strategies for developing transgenic plants that retain yield and quality characteristics despite adverse environmental conditions. 	<ul style="list-style-type: none"> Genetically modified switchgrass, an herbaceous energy crop, by Agrobacterium mediated transformation to successfully provide plant material that is more readily converted to ethanol by existing technologies. This technology improves the characteristics of crops grown for liquid transportation fuel production. Developed hybrid cultivars of switchgrass and demonstrated their potential to increase yields of biomass for use as bioenergy feedstock. These developments increase the potential of switchgrass as an energy crop. 		FY2003	
					FY2004	
					FY2005	
Cooperative State Research Education and Extension Service (CSREES)	Develop new nonfood uses for agricultural raw materials and wastes, and forestry materials	Develop more efficient conversion technologies conduct product test and evaluation	Chemical conversion of starch to polyhydroxypolyamides (PHPAs); chemical conversion of vegetable oils to low VOC paints and textile treatments; develop, test and evaluate vegetable oil-based industrial lubricants; progress in using ionic liquids to develop new chemical reactions for converting lignin into chemicals; use of transition metal ions for separation of saturated and unsaturated fatty acids during biodiesel production; optimized transesterification of oils for production of biodiesel and solvents; development of tailored biobased emulsifiers and surfactants from microorganisms; generation of baseline mechanical and chemical data for kenaf and continuous cellulose filaments; progress in developing vapor phase bioreactor to treat VOCs from ETOH production facilities; soy-based adhesive	Academia	FY2003	\$6,741,000
					FY2004	\$7,945,000
					FY2005	\$3,902,000

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Forest Service (FS)	Understand relationship between wood structure and management practices	Improve technical understanding of wood biochemistry and enzymes	Licensed a fermentaion process for xylitol production	USDA Forest Service Forest Products Laboratory and partners	FY2003	
					FY2004	\$400,000
					FY2005	\$400,000
Natural Resources Conservation Service (NRCS)	Biomass feedstocks having significant commercial potential for production of bioenergy, biofuels, and biobased products.	Overcoming economic barriers and indentifying appropriate agronomic and silvicultural methods for sustainable feedstock production from agricultural products, by-products and forest residues.	One project funded. No results to report. Project not completed as of this date.	Metabolix	FY2003	\$2,000,000
					FY2004	
					FY2005	

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Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	B. Agronomic Practices					
	Objective Three - Optimize agronomic practices for sustainable biomass feedstock production					
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Agricultural Research Service (ARS)	The bulk of ARS research on biobased products is conducted under ARS National Program 306, Quality and Utilization of Agricultural Products. The Program's mission is "To enhance the economic viability and competitiveness or otherwise enhancing their marketability, meeting consumer needs, developing environmentally friendly and efficient processing concepts, and expanding domestic and global market opportunities through the development of value-added food and nonfood products and processes."	<ul style="list-style-type: none"> Identify and characterize functional compounds and components in agricultural commodities and their byproducts. Improve understanding of the relationship between composition, molecular structure, and physical state and end-use functionality of these compounds and components. Use new knowledge of product properties and component interactions to develop functional intermediates or products. Identify and characterize by-product components for potential value-added products. Convert low value agricultural residues into higher value products. Develop improve and new techniques and technologies to convert agricultural products into value-added biobased products. Improve/develop processes and technologies that are environmentally benign. 		ARS-Phoenix, AR	FY2003	\$904,700
					FY2004	\$912,700
					FY2005	\$918,800
	<ul style="list-style-type: none"> Improved technology for sustainable production of feedstock plants. 	<ul style="list-style-type: none"> Development of economically feasible and environmentally sustainable management systems for producing large quantities of biomass feedstock, including: <ul style="list-style-type: none"> Practices, for production of perennial herbaceous energy crops, which improve quality of degraded cropland, pastureland, and rangeland. Systems for production of grasses that produce high yields and improve soil quality when grown as energy crops on Conservation Reserve Program (CRP) land and buffer strips. Practices, for production of perennial herbaceous energy crops, which improve quality of degraded cropland, pastureland, and rangeland. Systems for production of grasses that produce high yields and improve soil quality when grown as energy crops on Conservation Reserve Program (CRP) land and buffer strips. Development of technology for sustainable production of biomass feedstocks. 	<ul style="list-style-type: none"> Sustainable management technology was developed for growing switchgrass as an energy crop on marginal cropland in the western Corn Belt and was demonstrated to produce biomass amounts with the potential to yield more ethanol per acre than corn while providing environmental benefits similar to that of the Conservation Reserve Program. Results provide the technology for and demonstrate the potential for large quantities of ethanol producing crops to be grown while avoiding soil erosion and protecting soil quality. 		FY2003	
					FY2004	
					FY2005	
	<ul style="list-style-type: none"> Identify mechanisms influencing site-specific and landscape level decision making to optimize profit and minimize environmental impact of native grass production for biofuel feedstock. Develop perennial grasses and associated management practices for use in biomass energy crop production practices. Develop sustainable approaches for rain-fed biomass energy crop production systems for the southern Great Plains. 					

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<p>Cooperative State Research Education and Extension Service (CSREES)</p>	<p>Develop and establish new industrial crops</p>	<p>expand growing range of new crops, optimize irrigation practices and chemical applications</p>	<p>acreage established for hesperaloe to be harvested for specialty paper production; approximately 1 million acres canola has been established; development of superior varieties of meadowfoam in Pacific Northwest</p>	<p>Academia</p>	<p>FY2003</p>	<p>\$808,000</p>
					<p>FY2004</p>	<p>\$808,000</p>
					<p>FY2005</p>	<p>\$1,068,000</p>
<p>Forest Service (FS)</p>	<p>developing cost-effective, integrated forest management and production systems for biomass feedstocks</p>	<p>developing appropriate silvicultural practices, genotypes, short rotation woody cropping systems development</p>	<p>silvicultural practices for short rotation woody crop feedstock production; bottom land hardwood growth and yield models; evaluation of clonal, nutrition, and water effects on multiple species; influence of site factor modification on biomass allocation patterns and processes</p>	<p>USDA Forest Service Southern Research Station, North Central Research Station, Pacific Northwest Research Station, and partners</p>	<p>FY2003</p>	<p>\$2,000,000</p>
					<p>FY2004</p>	<p>\$2,400,000</p>
					<p>FY2005</p>	<p>\$2,800,000</p>

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Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	C. Feedstock Handling					
	Objective Four - Optimize logistics for collecting, storing and combining multiple feedstocks that can be applied for diverse applications in an environmentally sounds manner					
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Agricultural Research Service (ARS)	<ul style="list-style-type: none"> Improved technology for harvest, handling, and storage of biomass feedstock and for characterization of feedstock quality. 	<ul style="list-style-type: none"> Development of efficient, economical, and environmentally sustainable methods for harvesting, processing, and handling herbaceous crops and plant residues that retain or improve the energy density and quality of these materials as feedstocks for conversion to bioenergy and biobased products. Development of methods to add value on the farm to cellulosic biomass to be used as feedstock for ethanol production. Development of methods to accurately and rapidly assess the feedstock quality of herbaceous biomass. 			FY2003	
					FY2004	
					FY2005	
Forest Service (FS)	harvesting, collecting, processing and transporting loose forest residues are costly and present an economic barrier to recovery and utilization of wood for energy	develop effective practices for cost-effective, environmentally sound harvesting, storage, and transport of forest biomass feedstocks	biomass bundling system tested in the western US; synthesis of forest biomass harvesting information; model to compare biomass transportation alternatives for forest operations	USDA Forest Service Southern Research Station, Pacific Northwest Research Station, and partners	FY2003	\$400,000
					FY2004	\$850,000
					FY2005	\$850,000
Natural Resources Conservation Service (NRCS)	Production and handling of biomass feedstocks with significant commercial potential for application in the production of bioenergy, biofuels, and biobased products.	Improving quality, reducing raw material costs, improving energy efficiency.	Four projects funded. No results to report. Projects not completed as of this date.	University of Tennessee, Iowa State University, Imperial Young Farmers and Ranchers	FY2003	
					FY2004	\$4,717,123
					FY2005	\$1,920,000