Overview of ARS National Program 306 Quality and Utilization of Agricultural Products

Dr. Frank Flora, Senior National Program Leader
Product Quality/New Products & Processes

NP 213/307 Bioenergy Planning & Coordination Meeting, Beltsville, MD

November 29-December 1, 2006

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NP 306 Executive Management Team

- Dr. Frank Flora (co-leader)
  - NPL, Product Quality/New Products & Processes
- Dr. Robert Fireovid (co-leader)
  - NPL, Process Engineering/Chemistry

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Mission of NP 306

Enhance the economic viability and competitiveness of U.S. agriculture by maintaining the quality of harvested agricultural commodities 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.

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NP 306 Resources

- 93 projects primary to NP 306
  - 23 projects contributing to NP 306
- 235 SY's
- $83.1M (NTL)

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NP 306 RESEARCH LOCATIONS

Albany, CA
New Orleans, LA
Peoria, IL
Wyndmoor, PA
Lubbock, TX
Las Cruces, NM
Stoneville, MS
Fargo, ND
Manhattan, KS
Pullman, WA
Wooster, OH
Madison, WI
Aberdeen, ID*
Lincoln, NE*
Oxford, MS
Beltsville, MD
East Lansing, MI
Wenatchee, WA
Parlier, CA
Weslaco, TX
Lane, OK
Brookings, SD*
Athens, GA
Clemson, SC
Raleigh, NC
Dawson, GA
Winter Haven, FL
Ithaca, NY*
Kearneysville, WV*

*contributing projects

Program Components of NP 306

- Quality Characterization, Preservation, and Enhancement
- New Processes, New Uses, and Value-Added Biobased Products

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NP 306 Action Plan Problem Areas

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1a. Definition and Basis for Quality

Problem Area 1b. Methods to Evaluate and Predict Quality

Problem Area 1c. Factors and Processes That Affect Quality

Problem Area 1d. Preservation and/or Enhancement of Quality and Marketability

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1a. Definition and Basis for Quality

- Identify attributes that define quality of agricultural products.
- Develop better understanding of relationships between composition and component molecular structure and end-use quality and function.

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1b. Methods to Evaluate and Predict Quality

- Develop rapid, non-destructive methods for detection and measurement of physical/chemical quality attributes and quality defects.
- Develop and utilize multispectral techniques, imaging and image analysis, and methods incorporating information technology and artificial intelligence for further improvement of processing and grading.

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1c. Factors and Processes that Affect Quality

- Determine influence of pre-harvest factors on quality, including genetics, production practices and environment.
- Determine influence of post-harvest factors on quality, including storage, handling, grading, and processing.

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1d. Preservation and/or Enhancement of Quality and Marketability

- **Develop strategies to enhance intrinsic product quality and consistency.**

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NP 306 Action Plan Problem Areas

COMPONENT 2. New Processes, New Uses, and Value-Added Foods and Biobased Products

Problem Area 2a. New Product Technology

Problem Area 2b. New Uses for Agricultural By-products

Problem Area 2c. New and Improved Processes and Feedstocks

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 2. New Processes, New Uses, and Value-Added Foods and Biobased Products

Problem Area 2a. New Product Technology

- 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.

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 2. New Processes, New Uses, and Value-Added Foods and Biobased Products

Problem Area 2b. New Uses for Agricultural By-products

- Identify and characterize by-product components for potential value-added products.
- Convert low value agricultural residues into higher value products.

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NP 306 Action Plan Problem Areas Relevant to NP 213/307

COMPONENT 2. New Processes, New Uses, and Value-Added Foods and Biobased Products

Problem Area 2c. New and Improved Processes and Feedstocks

- Develop improved and new techniques and technologies to convert agricultural products into value-added biobased products.
- Improve/develop processes and technologies that are environmentally benign.

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NP 306 Projects Contributing to NP 213/307

Wyndmoor, PA

- ✓ **Production Of Value-Added Lipids, Biofuels, And Biobased Products From Fats And Oils, 1935-41000-066-00D, T. Foglia**
- ✓ **Enzyme-Based Technologies For Milling Grains And Producing Biobased Products And Fuels, 1935- 41000-070-00D, D. Johnston**

Albany, CA

- ✓ **Technologies Enabling Enhanced Product Quality, Product Opportunities, And Energy Efficiency In Grain Biorefining Systems, 5325-41000-047-00D, G. Robertson**

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NP 306 Projects Contributing to NP 213/307

Peoria, IL

✓ **New Microbial Systems for Utilization of Glycerol and Plant Lipids, 3620-4100-113-00D, C. Hou./T.M. Kuo**

Madison, WI

✓ **Value-Added Products From Forages And Biomass Energy Crops, 3655-41000-004-00D, P. Weimer, Madison, WI**

Winter Haven, FL

✓ **Enhanced Utilization of Carbohydrates and Polysaccharides from Citrus Processing Waste Streams , 6621-41000-011-00D, W. Widmer**

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NP 213/307 Projects Contributing to NP 306

Wyndmoor, PA

- ✓ **Aqueous Enzymatic Extraction Of Corn Oil And Value-Added Products From Corn Germ Produced In New Generation Dry-Grind Ethanol Processes, 1935-41000-069-00D, R. Moreau**
- ✓ **Economic Competitiveness Of Renewable Fuels Derived From Grains And Related Biomass, 1935-41000-072-00D, K. Hicks**

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NP 213/307 Projects Contributing to NP 306

Peoria, IL

- ✓ **Microbial Catalysts To Produce Fuel Ethanol And Value Added Products, 3620-41000-121-00D, K. Bischoff**
- ✓ **Cost-Effective Bioprocess Technologies For Production Of Biofuels From Lignocellulosic Biomass, 3620-41000-122-00D, B. Saha**
- ✓ **Genomics And Engineering Of Stress-Tolerant Microbes For Lower Cost Production Of Biofuels And Bioproducts, 3620-41000-123-00D, P. Slininger**
- ✓ **Improving The Performance Of Alternative Fuels And Co-Products From Vegetable Oils, 3620-41000-124-00D, S. Erhan**
- ✓ **Industrially Robust Enzymes And Microorganisms For Production Of Sugars And Ethanol From Agricultural Biomass, 3620-41000-118-00D, B. Dien**

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NP 213/307 Projects Contributing to NP 306

Albany, CA

✓ **Evolutionary Enzyme Design For Improved Biorefining Of Crops And Residues, 5325-41000-046-00D, D. Wong**

Brookings, SD

✓ **Fiber Extrusion To Improve Use And Production Of Ethanol Byproducts, 5447-41000-002-00D, K. Rosentrater**

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Similarities/Differences Between NP 213/307 and NP 306

NP 306 focuses on more traditional food, feed & fiber biorefineries - quality of raw materials, new uses for surpluses of corn starch & soybean oil, gin waste – but not exclusively to replace petroleum feedstocks.

NP 213/307 focuses on fuel biorefineries – quality of feedstocks, new uses for DDGS & glycerol – to replace petroleum feedstocks.

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Similarities/Differences Between NP 213/307 and NP 306

Issue	NP 213/307	NP 306
Reduced petroleum dependence	Primary	Secondary
Raw material/ feedstock quality	Primary	Primary
Products/ biorefineries	Fuel, energy	Food, feed, fiber, industrial
Co-products	DDGS, Glycerol	Corn starch, soybean oil, gin waste