

Needs and Opportunities for ARS in Food Quality and Processing Research

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National Program 306

Quality and Utilization of Agricultural Products



Bing cherries—rich in antioxidants and one of the fruits studied for antioxidant bioavailability.

- Maintaining quality of harvested produce
- Developing efficient processing concepts
- Developing value-added food/nonfood processes

Core Mission Objectives



- Determining/enhancing food quality
- Maintaining quality of commodities
- Identifying/characterizing functional compounds/components
- Developing dual-use or intermediate processes
- Developing/improving technologies

Chemist Gillian Eggleston (right) demonstrates the simple, rapid enzymatic mannitol test to Hedgardo M. Centella, a factory laboratory technician at Alma Sugarcane Factory, Lakeland, Louisiana. A spectrophotometer is required for the test.

Core Mission Objectives

- Developing value-added food/nonfood co-products and processes
- Developing knowledge and technology for postharvest quality measurement
- Developing new specialty products from crops and animals commodity products
- Increasing commodity volume and quality



Chemists Marshall L. Fishman (left) and Hoa K. Chau prepare orange peels for flash extraction of pectin using microwave heating under pressure.

NP 306 Research 2003 – 2008 - Impacts



Texturized Whey Proteins



Healthy Fruit Bars



Trim Technologies



Sytrinol & Flavoxine



National Program Cycle



Provide an analysis of the relevant trends, markets, economics, and science and technology needs of NP 306 Program

Provide guidance to the executive management team in establishing appropriate program directions for the next 5 years

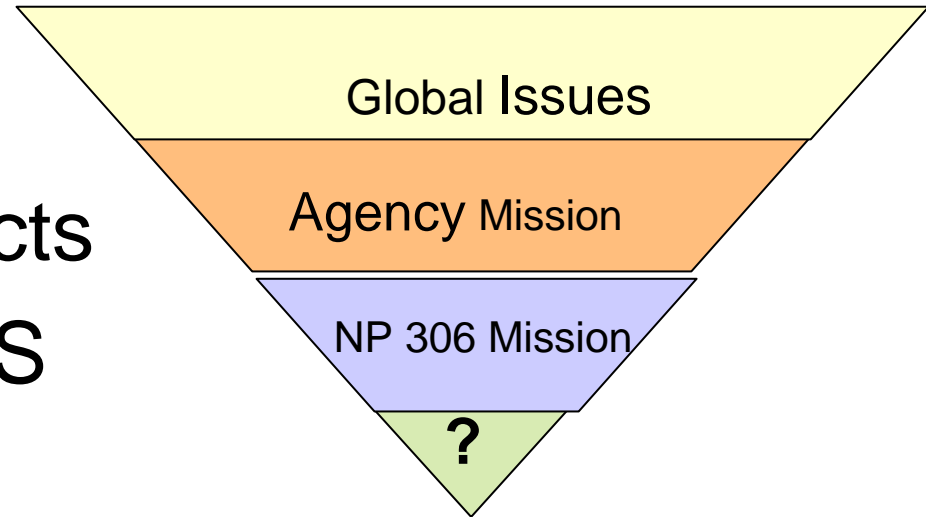
NPS Assignment March – May 2008



NP 306 Cycle 2009 – 2014



- Background issues
- Current markets for commodities and products
- Summary of current ARS activities
- Activities outside ARS
- ARS stakeholders' Issues
- Focus for NP 306 Food Research

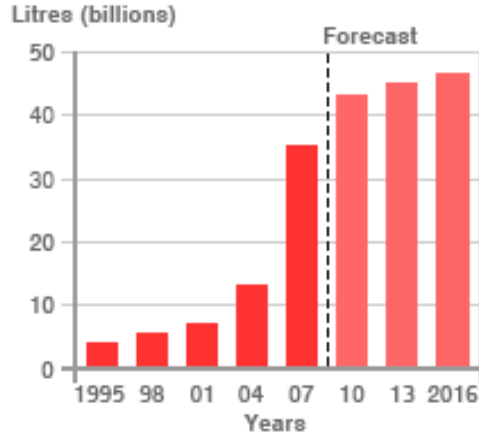


Research Questions

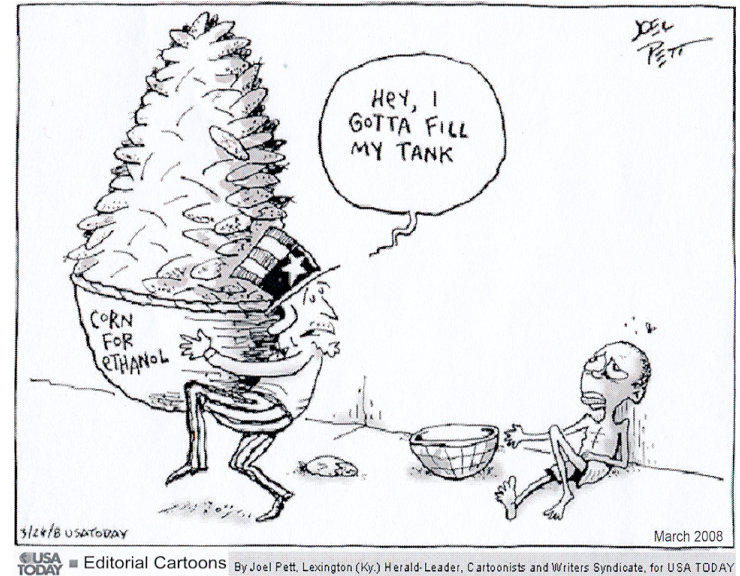
- Global, Agency, Mission Issues
- NP 306 Stakeholders
 - ARS Scientists

Bio-Economy & Food Scarcity

US ETHANOL PRODUCTION 1995-2016



SOURCE: ERS/FAO



Bio-economy: integration of energy and agricultural into one market

Biofuels “?”

Energy prices affected agricultural prices mostly on the input, resulting in lower output. Now, higher energy is affecting output prices as well. Wallace E. Tyner, 2007, Purdue University

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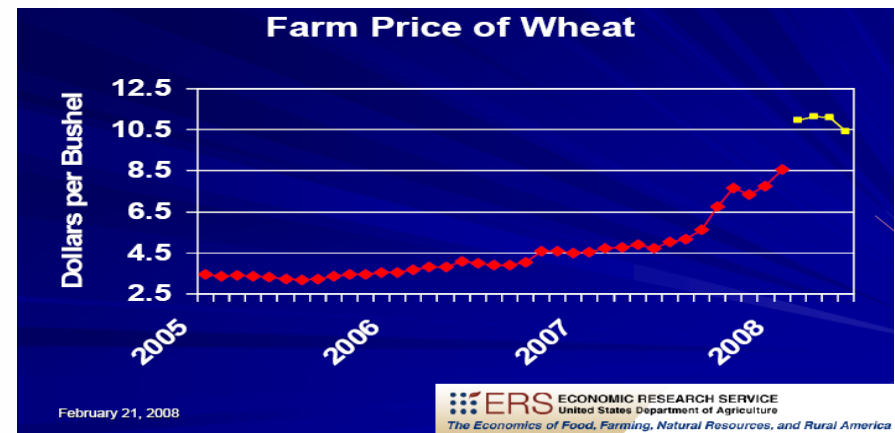
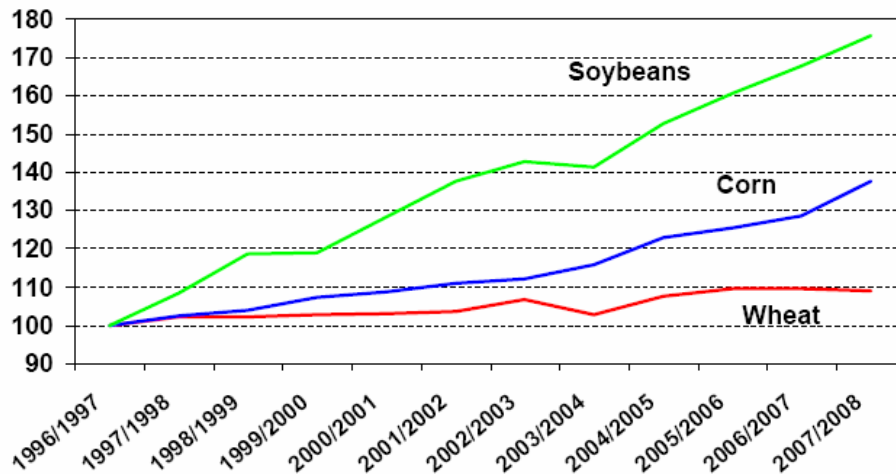


Current Market Economics



Changing Markets for Commodities and Products

Fig. 8—World oilseed demand climbs
1996 = 100



U.S. News & World Report
U.S. News
 MAY 18, 2008

How to Solve The Global Food Crisis

There are no easy answers. But here are key actions that could ward off impending disaster

\$4.99 U.S. / \$5.99 CANADA 2 01
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www.usnews.com

A Catastrophe Playing Out Around the World

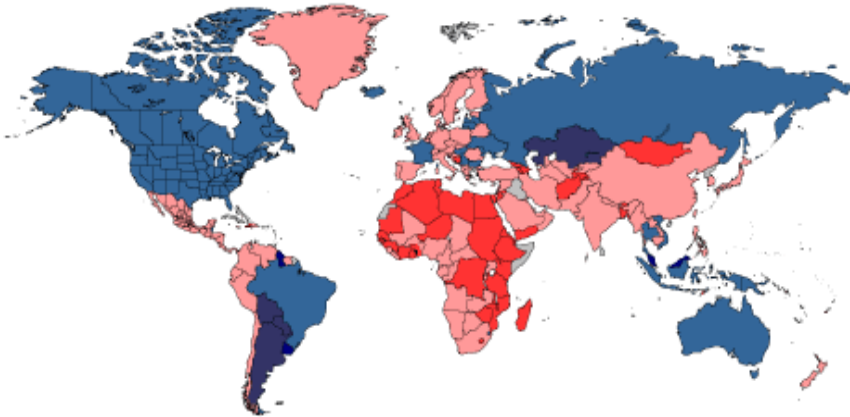
Food shortages and sharply rising prices have sparked riots in underdeveloped countries. Global grain stocks are at their lowest levels in decades, and the price of rice has risen 70 percent in the past year. Here is a look at some of the causes and further consequences.

- 1. United States:** Wholesale retailers Sam's Club and Costco recently imposed restrictions on bulk rice purchases. Reports of empty shelves and shortages followed.
 - Spring corn plantings have been delayed by rains, raising fears of a reduced crop. Farmers may switch from corn to soybeans if conditions don't improve by the end of the month.
- 2. Mexico:** Tens of thousands of people took to the streets of Mexico City in January 2007 to protest the rising cost of tortillas.
- 3. Haiti:** Food riots resulted in multiple deaths and led to the firing of the nation's prime minister, Jacques Alexis, in April. Prices of rice, beans, and fruit have climbed by at least 50 percent since 2007.
- 4. Argentina:** Farmers urging repeal of a soybean tax paralyzed grain shipments in March and are planning more blockades of the country's main highways.
- 5. Egypt:** With basic food costs up more than 50 percent in the past year, malaise is spreading. Hundreds of police were dispatched in April to dissolve a planned strike.
- 6. Somalia:** Two people were killed when police opened fire on protesters in the nation's capital on May 5. High food prices and shortages were cited as instigative causes.
- 7. Afghanistan:** 400 protesters blocked a main road to the nation's capital on April 22. Much of their anger was directed at Pakistan, which has stopped exporting wheat.
- 8. India:** The country has imposed export bans on almost all varieties of rice. Fearing shortages, it has also removed import tariffs on edible oils and maize.
- 9. Myanmar:** When a deadly 120-mph cyclone struck this month, it may also have seriously damaged the country's food supply.
- 10. Thailand:** The world's biggest rice exporter saw rice prices more than triple from January to April.
- 11. Mongolia:** A crowd of 20,000 protested soaring food prices in the nation's capital in April. Some staples have recently tripled in price.
- 12. China:** The country's middle class is expected to expand by 600 million people by 2020. Growing demand here and in India has been blamed in part for rising food prices.
- 13. Vietnam:** Suffering from double-digit inflation in food prices, the country has banned rice shipments until June.
- 14. Australia:** A severe six-year drought has reduced the rice crop by 98 percent. The country's largest rice mill was shut down in December.

Sources: U.S. Department of Agriculture, United Nations, Reuters, Foreign Policy, International Herald Tribune

\$1.2 Billion U.S to combat hunger; \$6 Billion projected

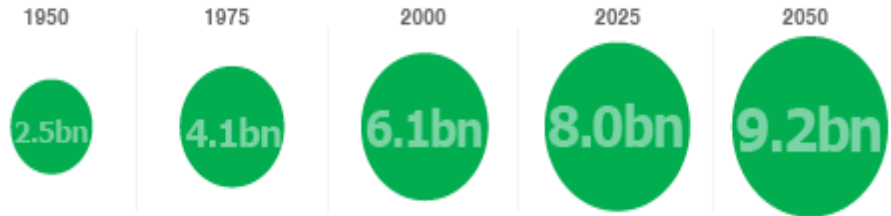
2007 - 2008 IMPACT OF PROJECTED FOOD PRICE INCREASES ON TRADE BALANCES



- Large losers (trade balance worsening > 1% 2005 GDP)
- Moderate losers (trade balance worsening < 1% 2005 GDP)
- Moderate gainers (trade balance improving < 1% 2005 GDP)
- Large gainers (trade balance improving > 1% 2005 GDP)
- No data

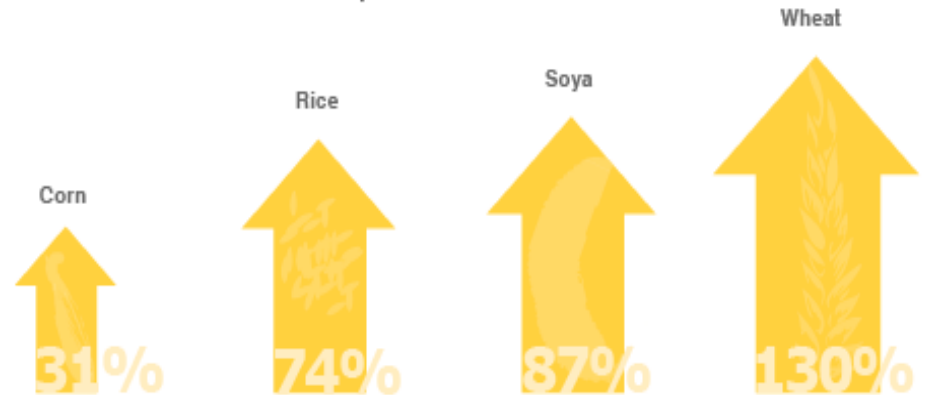
SOURCE: The World Bank

WORLD POPULATION GROWTH



SOURCE: UN

PRICE RISES IN A SINGLE YEAR, MARCH 2007-MARCH 2008



SOURCE: Bloomberg, except rice: FAO/ Jackson Son & Co

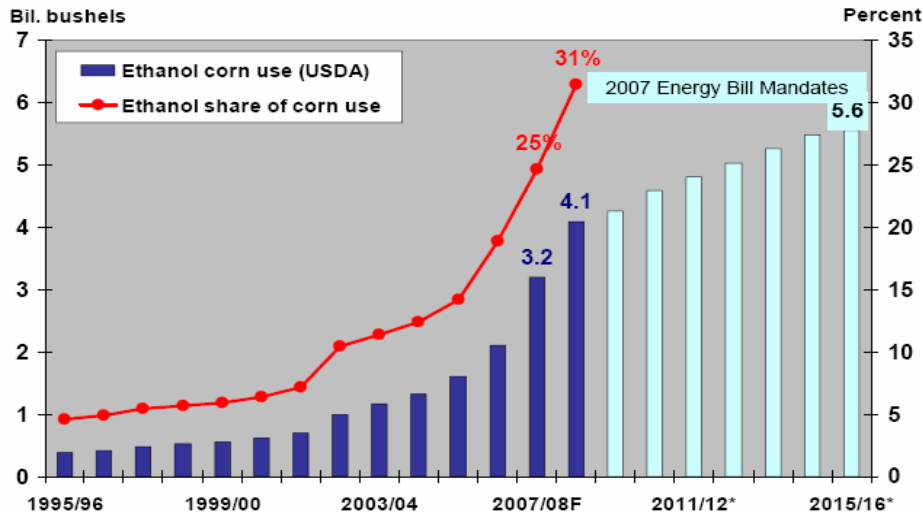


Current Market Economics

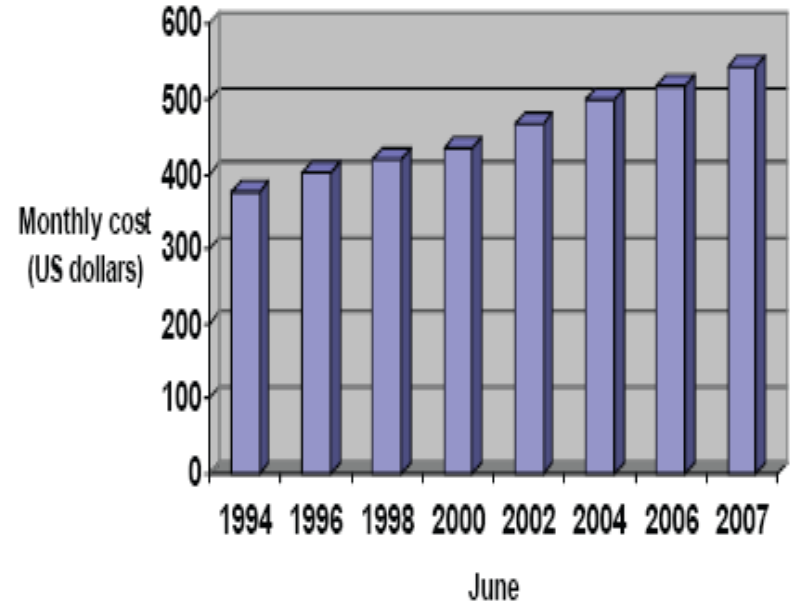


FOOD PRICES GOING UP AROUND THE WORLD

Fig. 6—Energy demand to drive corn use



Note: 2007/08 and 2008/09 are USDA projections. *Projections for 2009/10 and beyond are based on RFS mandates for corn starch based ethanol under the Energy Independence and Security Act of 2007.



FAO projects at least 10 years of rising food costs



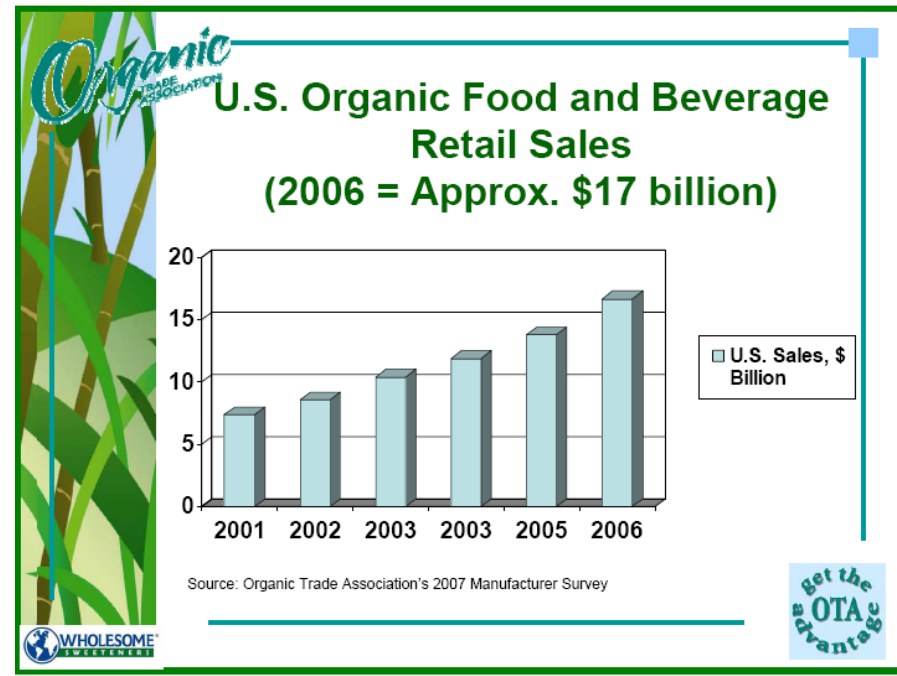
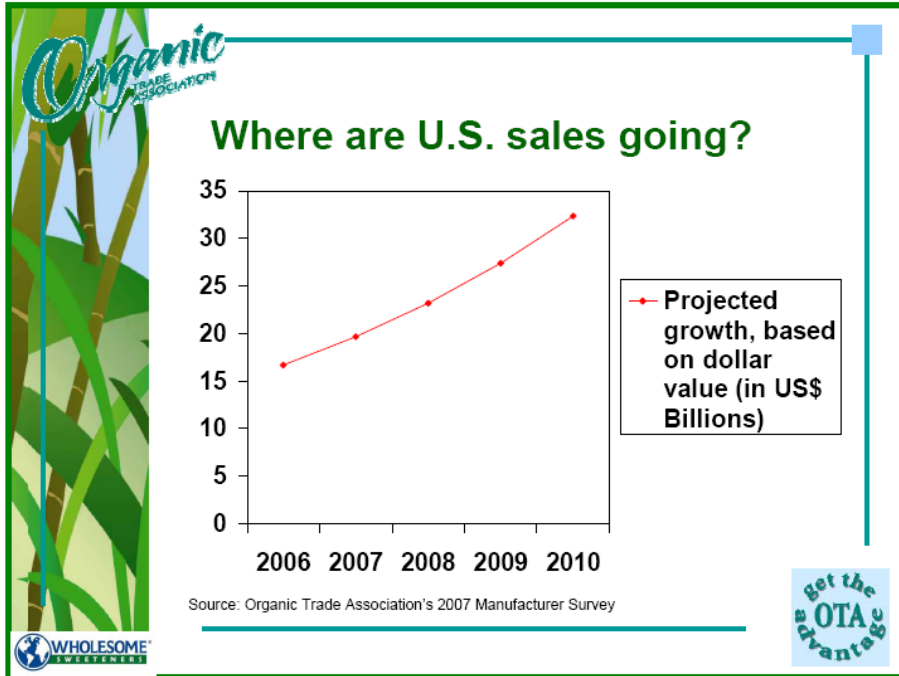
American Dietetic Association
Your link to nutrition and health™

Jennifer A. Weber, MPH, RD, manager of National Nutrition Policy, in ADA's Washington, DC, office.

April 2008 • Journal of the AMERICAN DIETETIC ASSOCIATION 616-617

NP 306 Research Needs and Opportunities for ARS in food quality and processing research

Organic Foods



Outlook Conference 2008, Nigel Willerton, CEO Wholesome Sweeteners,
 Source: Organic Trade Association's 2007 Manufacturer Survey

- Biofuels & Bio-economy
- Food Security (availability & Access)
- Health-full Quality Foods
- Obesity/Starvation
- Food/Feed Scarcity
- Rising Costs of foods.



Worries kept resurfacing during IMF-World Bank Spring Meetings about effect of higher food prices on low-income countries. (photo: Nani Gois/AFP/Getty)





United States Department of Agriculture

Research Outside ARS - **USDA** ▼

- **Globalization**
- **Specialty crops -- High quality produce**
- **Supply Complexity**
- **Animal Agriculture:** addressing high feed costs, poultry and swine
- **Healthy products**
- **Goods for human health --** wellness foods
- **Environment**
- **Capture value** from basic nutritional research
- **Bio-economy**

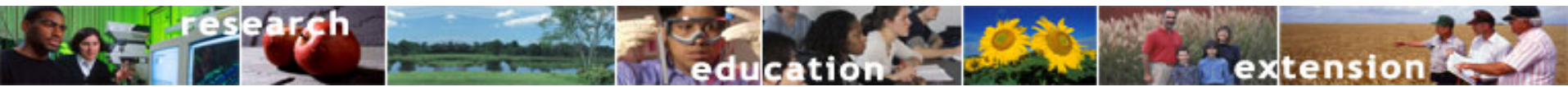
USDA's Congressional Research Report, Prepared for Members and Committees of US Congress, Previewing a 2007 Farm Bill (a multi-year legislation or authorization for agriculture and food), Updated January 3, 2007

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Research Outside ARS - CSREES



United States Department of Agriculture
Cooperative State Research, Education, and Extension Service



- **Human nutrition**, development of new products, understanding the **relationship between diet and food**
- **Health and wellness concerns**, nutrition and **obesity**
- Developing **new and sustainable feedstock**, utilization of bioconversion products
- Mitigating the **effect of bio-economy on food quality and availability** using **new technologies, innovative and cutting edge technologies**
- Developing and using **genomic data and biotechnology** tools to expand food and fiber production,

The National Association of State Universities and Land-Grant Colleges (NASULGC)



- explore linkages between food and health – obesity, metabolic syndrome
- develop new crops—Organic
- create better food and processing techniques, leading to higher values
- develop improved food qualities, (new/improved technologies)
- develop novel processing methods

Research Outside ARS - IFT

The Institute of Food technologist (IFT) is an international organization focused on food science and technology



Population

Water & Land Shortages

Changing Diets

- Wholesome, minimally processed, organic fresh-from-the-farm products
- Safe sustainable, innovative and healthful manner
- Fundamental science and new processing, packaging & preservation technologies

Research Outside ARS - Canada



Canada's Science and Technology Framework

Canada will **support leading edge** of developments that **research**

The challenges include how to fund agricultural research in ways that will **increase innovation**



Public agricultural research funding to **close critical gaps** which the public sector must fill and **the need to maintain public trust** in support of policy and regulations.

- **Productivity gap,**
- **Sustainable growth**
- **Strengthening knowledge**
- **Health,** environmental
- Supporting **basic research**



Activities of the European Union
Agriculture

European Union Committee on Agricultural Research, 2007

Research Outside ARS - EU

- Bio-economy
- Climate shock
- Energy crisis
-
- Food crisis/ food security
- Cooperation with nature
-
- Social problems of health

Researchable outcomes

- Sustainability
- Security
- Knowledge
- Competitiveness



United Nations - FAO

FAO Agricultural Outlook 2006 – 2015 report



- **Intensification of competition** from growing markets, Brazil, China, and India
- **Increasing** per capita food consumption from **rising incomes** and growing trade
- **Health paradigm**
- **Food Availability**
- **Organic Food Supply**
- **Food Access**
- **Food Quality & Nutrition**
- **Hidden hunger:** inadequate nutrient intake—supplements

World Bank Launches \$1.2 Billion Fast-Track Facility for Food Crisis

Agricultural Support to Increase to \$6 Billion, New Risk Management Tools for Crops



Stakeholders Research Needs



¹Appendix: List of Stakeholders

National Watermelon Promotion Board;
USA Rice Federation;
SoyNewHorizons;
Pickle packers International;
Georgia Peanut Commission;
California League of Food Processors;
Florida Citrus Processors Association;
National Barley Foods Council (NBIC);
American Sugar Cane League;
Sugar Processing Research institute;
Washington Tree Fruit Research Commission;
Dairy Management Inc.;
National Association of Wheat Growers (NWIC);
American Bakers Association.

- Develop new technologies for fractionation, isolation, extraction, reduction (low salt), concentration
- Health-promoting wholesome foods
- New processing technologies for intelligent delivery
- Stability of ingredients in foods



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- **Improve processing value and end-product quality**
- **Develop new rapid, objective methods to evaluate grain quality and functionality**
- **Develop rapid measures of functionality**
- **Products with health portfolios**



Stakeholders Research Needs

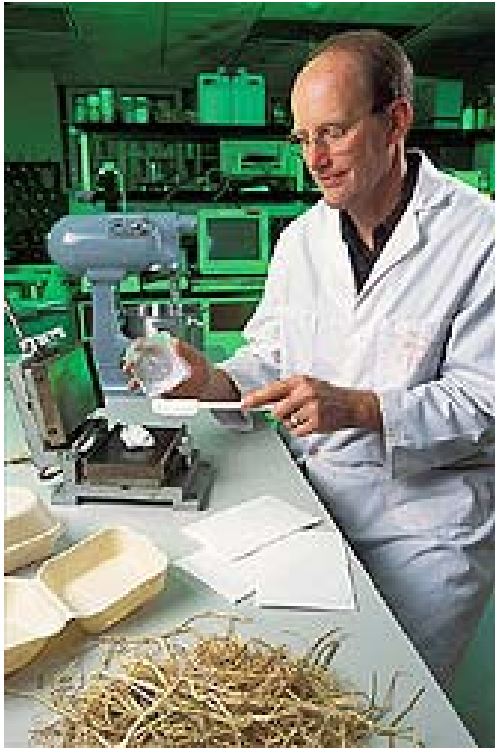


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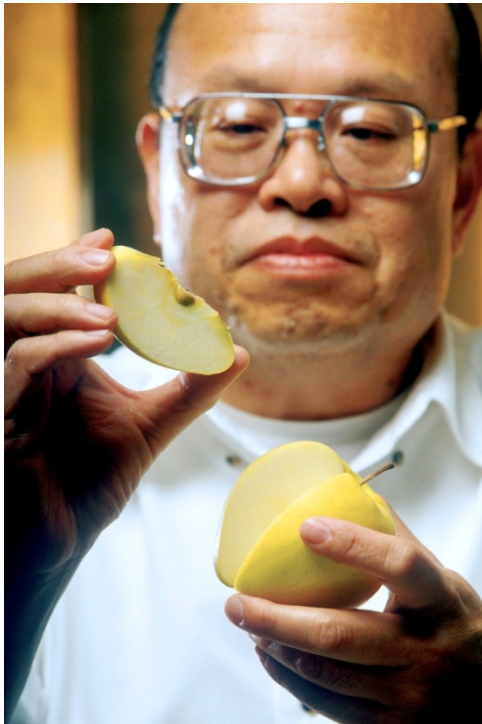
- **Nutrition, safe foods, food defense**
- **Food quality; Acrylamide, Allergen, Folic Acid**
- **Food Security**
- **Health & Obesity**
- **Low Carbs/ Net Carbs**
- **Omega-3 Nutrient Content Claims**



- Identification/isolation of health components
- New technologies to deliver nutrients
- Biochemical & molecular markers
- New technologies & processes
- New sources of dietary fibers



Suggested Research-ARS Scientists



- Enhancing shelf-life
- Co-products from bio-fermentation
- High-speed sensors
- Develop new products
- Sources of phytochemicals
- Techniques to measure volatiles



Suggested Research-ARS Scientists



PEGGY GREB [D1044-1]



Chemist Nicolette Prevost treats cotton fabrics with a chitosan formulation, which is designed to confer blood-clotting and antibacterial properties on wound dressings and specialty garments.

- internationally competitive processes
- Discover GRAS chemical/biological
- Organic food processing
- Food matrix, health/disease interface
- Healthy foods, and food allergens



How to solve The Global Food Crisis



REUTERS

U.S. food price rise to be largest in 18 years: USDA

Mon May 19, 2008 3:40pm
By Charles Abbott

WASHINGTON (Reuters) - U.S. food prices will rise by 5 percent this year, the largest increase since 1990 Glauber, USDA chief economist,

The budgets of institutions that delivered the world from famine in the **1970s disappeared when** ‘People felt that the world food crisis was solved, Robert S. Zeigler, the director general of the rice institute.



Food Security, Quality and Nutrition Research:



- Nutrient Discovery
- Process Discovery
- Characterization & Preservation
- Technology to prevent quality deterioration; eliminate contamination
- Improve nutritional quality
- New uses, processes & products
- Waste recovery, feed & fiber



Recommended Areas of Focus for ARS 2009



Food Security, Quality and Nutrition Research:



- Prevention of food quality losses
- Value-added qualities/properties
- Maintaining nutrients
- Nutrient availability, etc.



Final Words



Specifically, NP 306 Projects needs to Consider the Following Questions

- Robust objectives, adapted to changing circumstances?
- Do they generate economic value?
- Core competency of the CRIS constitute a reservoir for innovations?
- Networking across disciplines - connectiveness (food/feed/fiber/fuel, processing and health)?
- Do the outcomes impact food resources (food, feed, fiber, fuel)?
- Does the outcome result in public good?



Final Words



NP 306 Food Research Outcomes

1. Availability of sufficient foods, feeds and fiber
2. New processing and preservation methods
3. Utilization of uncommon commodities
4. Improvement in food quality and quantity
5. Better nutrients
6. Wholesomeness across the food chain
7. Specialty foods, e.g. food for aging population

FOGGY GARDEN 00 1112-01



Bing cherries—rich in antioxidants and one of the fruits studied for antioxidant bioavailability.



STEPHEN AUSMUS (D-171-3)



Technician David Buchanan uses a recording penetrometer to measure apple firmness, a key component of apple fruit quality.