

Establishing an Illinois Soy Foods Center for Research and Education

Principal Investigators: Barbara P. Klein and Keith R. Cadwallader, Department of Food Science and Human Nutrition

Executive Summary:

The goal of the Illinois Center for Soy Foods (ICSF) is to promote consumption of soy foods, thereby providing benefits to growers, processors and consumers in Illinois. To achieve this goal, the ICSF has implemented numerous research, training and outreach projects and activities. Training targeted to consumers and educators has provided the necessary knowledge that can lead to a continued increase in demand for soy foods. The ability for the industry to meet those demands with innovative applications of soy food ingredients has been aided by the ICSF's technical workshops and pilot plant studies. A key accomplishment of the ICSF has been its ability to become self-sustaining with outside funding coming from the Illinois Soybean Association, and from the federal, state government and industry resources.

Primary Objectives and Goals:

The Illinois Center for Soy Foods (ICSF) has been dedicated *to promoting consumption of soy foods, thereby seeking to provide financial benefits to growers and processors in the state, technological innovations to large and small-scale processors globally, as well as health benefits to consumers*. In the US and the rest of the developed world, major hurdles to widespread consumption of soy foods have been the negative consumer perceptions of soy and the limited numbers of highly acceptable soy food products in the marketplace. In North America, the health benefits of soy are quite well known and are major drivers of the expansion of soy foods market.

Financial support from the C-FAR Sentinel program and the State of Illinois enabled the establishment of ICSF, which has brought together the necessary personnel and facilities for conducting research, education, and outreach efforts to meet consumer and industry needs in the US. These include:

- a well equipped soy processing pilot plant,
- a site for sensory and consumer evaluation of products,
- a test kitchen suitable for food processing research at micro-level and home kitchen level,
- a system for technology transfer to small and medium sized processors,
- marketing know-how for soy food product development, distribution, pricing, and promotion.

The ICSF has developed and continues to explore innovative ways to increase usage of soy in our food system as described below.

Outcomes and Impacts:

New markets for soy foods are critical and school food service is an important focus. Programs in school districts throughout the U.S. emphasize the need for lower calorie and fat choices in school lunch programs, coupled with increased exercise. Educational opportunities exist for showing how soy can be incorporated into school lunches. Results from the pilot project "*ISoy: A Better School Lunch*" indicated that addition of soy products, either by substitution or enhancement of meat-based entrees, lowered fat, cholesterol and calories in typical lunch offerings. Soy-based entrees were as acceptable as the more familiar meat products, such as chili, spaghetti, chicken nuggets and ravioli. Findings of the ISoy project have been disseminated to

school districts throughout the state. Participating school foodservice directors are participated in a “success story” panel at the Illinois Association of School Districts annual meeting in Chicago in November 2005. The information was also presented at the WIC Regional Meeting in Albany, NY in October 2005. Learning modules for elementary school students, teachers and food service personnel are under development. Possible spin-offs from the school foodservice project are to the institutional market, including prisons and hospitals.

Five cookbooks in the Soy in the American Kitchen series have been completed and are available through the ICSF website. These include:

Cadwallader, K.R., Klein, B.P., Khanna, P., Chen, D., Nash, M., Puzey, M. and Sullivan, C.L. 2005. *Around the World with Soy*. Illinois Center for Soy Foods, University of Illinois, University Board of Trustees, Urbana, IL.

Cadwallader, K.R., Klein, B.P., Sullivan, C.L., Nash, M., Khanna, P. and Weingartner, K.E. 2004. *Soy for the Last Minute Chef*. Illinois Center for Soy Foods, University of Illinois, University Board of Trustees, Urbana, IL.

Klein, B.P., Cadwallader, K.R., Chen, D., Khanna, P., Sullivan, C.L. and Weingartner, K.E. 2003. *Baking with Soy*. Illinois Center for Soy Foods, University of Illinois, University Board of Trustees, Urbana, IL.

Klein, B.P., Cadwallader, K.R., Chen, D., Khanna, P., Sullivan, C.L. and Weingartner, K.E. 2002. *Textured Vegetable Protein in the American Kitchen*. Illinois Center for Soy Foods, University of Illinois, University Board of Trustees, Urbana, IL.

Klein, B.P., Cadwallader, K.R., Chen, D., Khanna, P. and Weingartner, K.E. 2002. *Tofu in the American Kitchen*. Illinois Center for Soy Foods, University of Illinois, University Board of Trustees, Urbana, IL.

A sixth cookbook titled *Soy on the Menu* with scaled up recipes for use by food service operators at educational institutions, especially in colleges and universities, restaurant chains, hospitals, and prisons, etc. is near completion. It is being published in two versions, CD and printed book. It will also be available in PDF format on the ICSF website for free download.

Information and recipe booklets dealing with meat and soy combinations, soy for vegetarians, and home processing of soy have also been prepared. A *Soy Foods Starter Kit* was developed to familiarize consumers with a variety of soy products commercially. The Kit also includes a *Soy for Beginners* booklet. Soy foods developed by ICSF have been frequently featured at educational and athletic events, including Salute to Agriculture Day at Memorial Stadium. ICSF products were also included in the agriculture gift baskets sent to state legislators by the College of ACES and commodity groups.

The ICSF worked closely with media to disseminate information on the health benefits of soy, the latest innovations in soy foods, and results from soy foods related research projects to consumers. The ICSF continues to have an annual Soy Foods Tasting event to show how soy foods can play a role in daily diets. Invitees for the soy tasting include health and nutrition

professionals, foodservice operators and the food industry. Although the *Soy Source*, a retail “store”, in Bevier Hall is not longer in operation, the Bevier Café continues to feature new soy foods during the school year.

Educational and outreach efforts have been a high priority for the ICSF. Short courses related to soy flavor, product development and nutritional benefits of soy are part of the continuing effort to reach both U.S. and foreign markets. INTSOY (International Soybean Program) was the recipient of the Bor S. Luh International Award of the Institute of Food Technologists in 2005. Working with WISHH, ICSF has conducted workshops for private voluntary organizations and government agencies from the US and other countries. ICSF personnel spoke at schools, community organizations, and national and international food science and dietetics meetings about the health benefits of soy and the ease of using it, as well as research studies. Outreach programs were held in the field for international audiences in Botswana, Cote d' Ivoire, Haiti, Honduras, Kenya, Mozambique, Senegal, Tajikistan, Thailand, Uganda, and Vietnam on how to add soy to local diets. Outreach programs for Afghanistan and India are under development. The Center has also provided research and technical services to several companies on problems related to extrusion and dairy analogues.

Beneficiaries:

Activities of the ICSF have had global and domestic impacts on both consumers and producers of soy foods. The ICSF has provided technical assistance to the soy foods industry through workshops and pilot plant studies. The ICSF has reached out to both domestic and international consumers to promote the consumption of soy as a healthy lifestyle.

Leveraged Funding:

Researchers affiliated with the ICSF and UIUC have had continued success in receiving grants for soy foods related research. The ICSF seed grant program targeted research issues facing soy consumption was successful. Six awardees used the grants to conduct research related to soy functionality, flavor, processing and allergens, and for the study of issues related to marketing of soy foods. The Soy Foods Managed Research Area (MRA) was established in 2004 by the Illinois Soybean Association and operated under the umbrella of the ICSF and is directed by Dr. Keith Cadwallader. The mission of the Soy Foods MRA is to connect the Illinois Soybean Association with leading food scientists, nutritionists and other researchers in an effort to promote the further development and consumption of soy foods through targeted research areas.

Since the ICSF was established with C-FAR funding it has received additional external financial support of nearly \$4 million from the Illinois Soybean Association, state and federal governments and the soybean industry.

Specific externally funded soy-related projects include:

Dong, F. and Khanna, P. et al. *Future Foods Illinois*. USDA-Special Grants Program, 2004-2007, \$1,037,161.

Khanna et al. World Initiative for Soy in Human Health. Illinois Soybean Association, \$1,500,000 (accumulated amount going into WISHH program).

Cadwallader, K.R. *Soy Nutrition and Food Sciences Managed Research Area*. Illinois Soybean Association, January 1, 2006 – December 31, 2006, \$200,000.

Cadwallader, K.R. *Soy Foods Managed Research Area (Bridge Funding)*. Illinois Soybean Program Operating Board, Sept 1, 2005 – December 31, 2005, \$18,750.

Cadwallader, K.R. (Klein, B.P, Khanna, P. collaborators) *Illinois Soy Foods Center for Research and Education (Bridge Funding)*. Illinois Soybean Program Operating Board, Sept 1, 2005 – December 31, 2005, \$25,000

Cadwallader, K.R. *Inverse Gas Chromatographic Measurement of Flavor Interactions with Solid Food Matrices under Controlled Relative Humidity*. National Research Initiative Competitive Grants Program 71.1B, USDA, September 1, 2005-August 31, 2008, \$287,417.

Lee, S.-Y., Cadwallader, K.R, Lee, Y. *Factors affecting astringency/bitterness in soy flakes and soy protein isolates (SPIs)[renewal]*. Co-sponsored by Cargill Food Systems Design and Midwest Advanced Food Manufacturing Alliance – USDA (MAFMA), 2005-2006, \$48,627.

Cadwallader, K.R. *Soy Foods Managed Research Area*. Illinois Soybean Program Operating Board, 2004-2005, \$75,000

Cadwallader, K.R. (Klein, B.P, Khanna, P. collaborators) *Illinois Soy Foods Center for Research and Education*. Illinois Soybean Program Operating Board, 2004-2005, \$100,000.

Lee, S.-Y. and Cadwallader, K.R. *Factors affecting astringency/bitterness in soy flakes and soy protein isolates (SPIs)[renewal]*. Co-sponsored by Cargill Food Systems Design and Midwest Advanced Food Manufacturing Alliance – USDA (MAFMA), 2004-2005, \$44,500.

Klein, B.P., Khanna, P. (and Cadwallader, K.R.) *Introducing Soy Products in Illinois School Lunch Programs*. Illinois Soybean Program Operating Board (ISPOB) and Archer Daniels Midland, 2004-2007, \$214,316.

Anon. *The Roles of Soybean Components in Human Health*. Illinois Soybean Association, 2004, \$42,000.

Cadwallader, K.R. *Soy Foods Managed Research Area*. Illinois Soybean Program Operating Board, 2003-2004, \$25,000.

Lee, S.-Y. and Cadwallader, K.R. *Factors affecting astringency/bitterness in soy flakes and soy protein isolates (SPIs)*. Co-sponsored by Cargill Food Systems Design and Midwest Advanced Food Manufacturing Alliance – USDA (MAFMA), 2003-2004, \$115,114 (Cargill) and \$46,677 (MAFMA).

de Mejia, E. *Bioactive Proteins in Industrial Soy Streams*. Midwest Advanced Food Manufacturing Alliance – USDA (MAFMA), 2003-2004, \$21,300.

Cadwallader, K.R. and Klein, B.P. *Development of High-Energy, Nutrient-Dense Emergency Relief Food Product*. Illinois Soybean Program Operating Board (ISPOB), 2002-2003, \$15,000.

Cadwallader, K.R. and Klein, B.P. *Flavor Properties of Soy Protein Isolates: Characterization of Bitter and Astringent Compounds and Their Relationship to Overall Flavor*. Kraft Foods, Inc., 2000-2003, \$153,000.

Website:

The consumer research and education facility in the National Soybean Research Center is the focal point for education and research on health aspects of soy foods. The ICSF website, www.soyfoodsillinois.uiuc.edu, remains a primary resource for consumers on soy foods and nutrition.