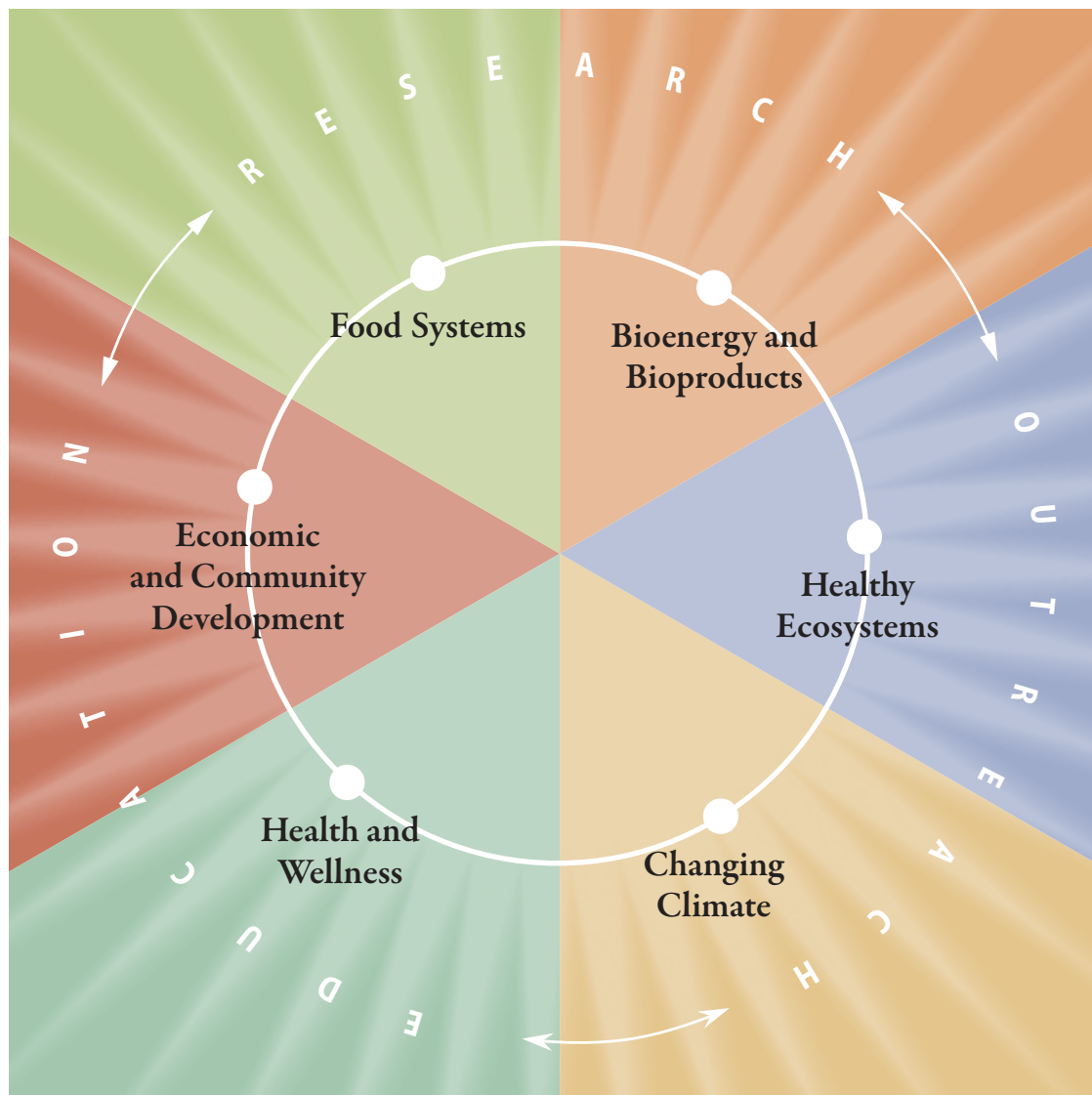


PRIORITY THEMES

The priority themes address grand challenges among 21st-century societal issues where CALS has the potential to make significant impact and to lead in the creation and dissemination of new knowledge. The themes are intended to be cross-cutting in several ways. The complex issues they entail require interdisciplinary expertise; they require advances in fundamental knowledge and basic sciences, including the continued development of new tools; and they impact all our mission areas, including education and outreach, in addition to research. Mention of specific CALS activities is meant not to be comprehensive, but to provide examples of our current relevant work.

- Food Systems
 - Bioenergy and Bioproducts
 - Healthy Ecosystems
- Changing Climate
 - Health and Wellness
 - Economic and Community Development



■ FOOD SYSTEMS

A “food system” includes activities from production to consumption, from farm to table, at local to global scales. The 20th century saw great increases in food production and reduction of hunger. Developing effective food systems—ones that ensure a safe, secure, sustainable, affordable, accessible and nutritious food supply for all—to feed 9 billion people by 2050 will require continued innovation and dissemination of knowledge. Work in CALS addresses challenges across the spectrum of issues in production, distribution and consumption, including in such emerging areas as urban food systems.

Photo by Wolfgang Hoffmann BS'75 MS'79



CALS and UW–Extension have long worked with the state and private sector to ensure that Wisconsin’s dairy, meat and other food industries remain strong. A planned expansion and modernization of campus dairy and meat research and production facilities will help sharpen the state’s cutting edge in these signature fields.

Soil science professor Stephen Ventura (photo below, far left) is leading a USDA-funded study on how changes to local and regional food systems can promote healthy eating in urban communities. His partners include the Milwaukee-based nonprofit Growing Power (CEO Will Allen, far right), the University of Wisconsin–Milwaukee, and a number of other universities and community-based food organizations.

Photo by Sevie Kenyon BS'80 MS'06



The Plant Breeding and Plant Genetics program at CALS, run jointly by the departments of agronomy and horticulture, is one of the strongest plant breeding programs in the nation, helping farmers (and eaters) everywhere by developing the best plant varieties for a wide range of growing conditions. In the photo above, horticulture professor Irwin Goldman selectively breeds beet plants in his campus greenhouse.

Photo by Michael Kienitz



■ BIOENERGY AND BIOPRODUCTS

Energy and products derived from living systems have the potential to reduce global dependence on fossil fuels while enhancing ecological resilience and economic vitality. Realizing this potential requires fundamental scientific breakthroughs, technical and social innovation, and thoughtful application and monitoring so that the new fuels and bioproducts are effective and affordable. CALS activities include converting biomass to fuels and chemicals; generating energy from manure and other wastes while also meeting needs for disposal and management of nutrients; and supporting decision-making based on understanding the social, economic and environmental impacts of energy systems.



Photo (top) by Beth Skogen

Photo (bottom) by Matt Wisniewski/GLBRC



CALS researchers are testing a wide range of plants at the Arlington Agricultural Research Station for their potential as feedstock for biofuels.

The founding of the Great Lakes Bioenergy Research Center (GLBRC) at CALS with an initial \$125 million from the U.S. Department of Energy in 2007 kicked off CALS as a global leader in biofuels research. In 2013 the DOE renewed its commitment with another \$25 million per year for five years. CALS bacteriology professor Tim Donohue leads the effort, which is now based at the new Wisconsin Energy Institute.

CALS biological systems engineering professor Troy Runge (center) analyzes manure separation techniques in his lab at the Wisconsin Energy Institute.

CALS researchers are working to convert dairy farm manure into a number of useful bioproducts. In a \$7 million federal grant project with Maple Leaf Dairy near Manitowoc, they are separating manure into components that serve as the basis for products as varied as biogas, fertilizer, chemicals, bio-plastics, animal bedding and mulch. Their goal is to improve manure separation technologies until their benefits can be realized on a broad commercial scale.

■ HEALTHY ECOSYSTEMS

Our landscapes provide many services, from food, fiber and fuel to clean water and air, from flood management and wildlife habitat to recreation and aesthetics. Competing demands on natural resources, made more intense by growing populations, make it a challenge to manage landscapes in ways that balance these services. Combining understanding of how these ecosystems respond to land management with inventive technologies and approaches helps foster innovative policies and economic opportunities. CALS efforts include designing and managing landscapes in ways that help provide clean water and air, mitigate climate change and promote biodiversity while building communities and offering economic gain.

Photos by Wolfgang Hoffmann BS'75 MS'79



How can we protect bees and other pollinators that are so crucial to our food supply? CALS researchers in entomology, community and environmental sociology, and bacteriology are working to keep bees healthy through identifying which hive environments, landscapes, public policies and other conditions allow them to flourish.



Our state's leading vegetable bin needs water—but some irrigation practices and other forces may be putting pressure on the region's lakes and streams. With the Central Sands Water Initiative, CALS researchers and their partners across campus are helping farmers, businesses, residents, environmental advocates and other groups find common ground on water use in central Wisconsin.

■ CHANGING CLIMATE

Impacts of increasingly erratic weather patterns and the general warming of the climate are expected to affect families, businesses, communities and ecosystems in complex ways and with unclear outcomes. Flooding, drought and unseasonable temperatures affect agricultural production, wildlife migration patterns and species distribution. In wild places and managed ecosystems alike, climate change introduces stressors and allows pests and pathogens to invade new territories, affecting plants, animals and humans. We seek to advance understanding of the causes of climate change and its many impacts as well as develop strategies—from new breeds and on-farm innovations to insect and pathogen control strategies—that are sufficiently robust to adapt to and potentially mitigate extreme weather conditions.



Photo (top) by Wolfgang Hoffmann BS'75 MS'79

Photo (bottom) by Sevie Kenyon BS'80 MS'06



Cows at the Arlington Agricultural Research Station dairy barn.

In a \$9.9 million, multistate research project funded by the USDA, CALS/UW–Extension soil science professor Matt Ruark and CALS genetics and agronomy professor Molly Jahn are leading efforts to identify dairy production practices that minimize the emission of greenhouse gasses and are more resilient to the effects of changes in climate.

Janesville farmer Kirk Leach BS'78 showing irrigated versus unirrigated corn during the 2012 drought.

CALS and UW–Extension researchers work with farmers all over the state to adapt to the effects of climate changes—work that includes developing crop varieties that are resistant to drought or to pests brought on by changing weather. CALS agronomy professor Chris Kucharik serves as co-chair of the agricultural working group with the Wisconsin Initiative on Climate Change Impacts (WICCI), a partnership between UW–Madison, the Wisconsin Department of Natural Resources and an array of other public and private institutions.

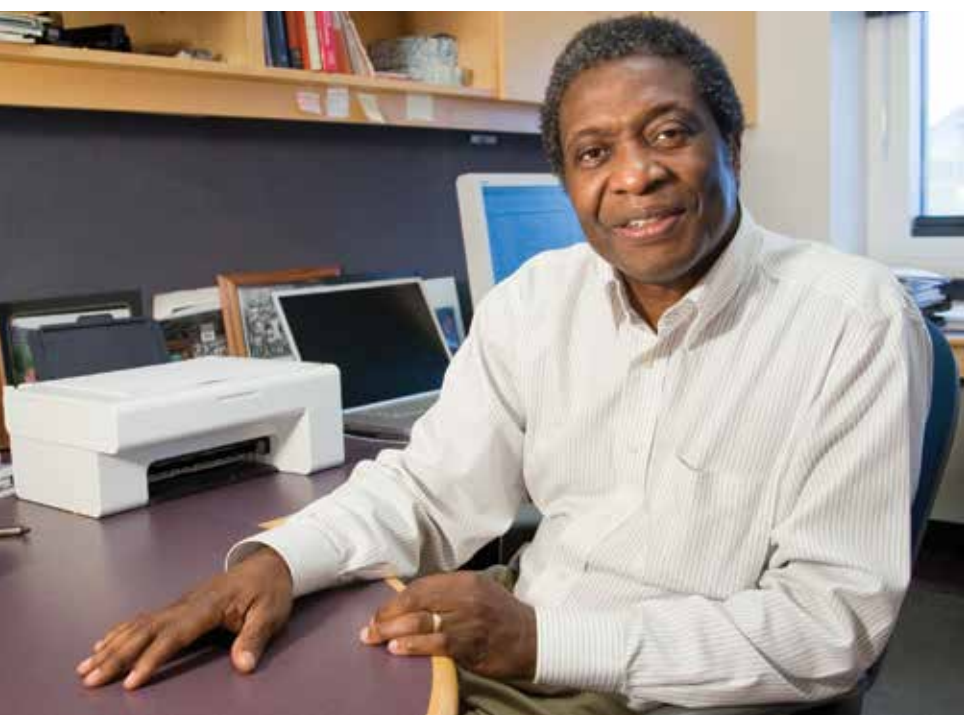
■ HEALTH AND WELLNESS

Through basic and applied research, CALS contributes to the promotion of health and the reduction of disease in humans, animals and plants. The obesity epidemic, which exacerbates many common diseases, has created an urgent need to better understand its causes and prevention. CALS brings diverse strengths to this endeavor, including expertise in metabolomics, functional foods and nutraceuticals. Moreover, CALS' efforts include improving animal health and well-being, which contribute not only to a safe and healthy food supply but also can directly impact human health via animal-vector diseases.

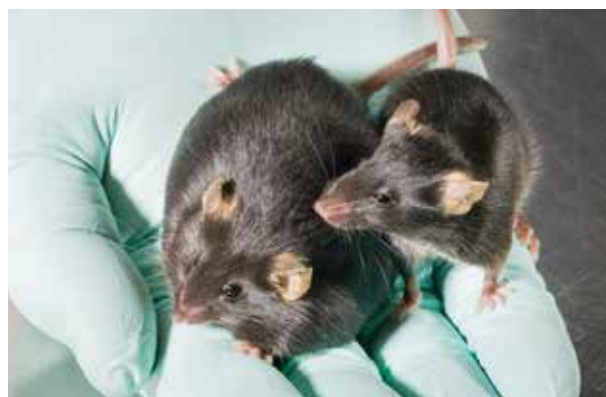


CALS biochemistry professor emeritus Hector DeLuca has conducted decades of research defining how the body's organs use vitamin D. His findings include the development of vitamin D-based compounds to address such ailments as osteoporosis and bone diseases associated with kidney failure—work that has resulted in some 1,500 patents earning more than \$500 million in royalties, according to the Wisconsin Alumni Research Foundation (WARF), the university's tech transfer office. WARF was conceived of by DeLuca's mentor, Harry Steenbock, last century to ensure that proceeds from university-based patents—starting with his own work increasing vitamin D content in foods, thus eliminating rickets—are invested in further university research.

Photos by Wolfgang Hoffmann BS'75 MS'79



Same diet, different sizes: James Ntambi, a CALS professor of nutritional sciences and biochemistry, worked with mice to identify how foods interact with a particular gene to determine how the body stores fat from food—work that is critical to understanding and addressing obesity.



■ ECONOMIC AND COMMUNITY DEVELOPMENT

In Wisconsin and around the world, local economies are increasingly influenced by global markets. This brings both challenges and opportunities that affect people, businesses, communities and the environment. Building healthy local economies and prosperous, stable communities requires understanding their internal dynamics and the nature of their interactions with national and global systems. That understanding is the foundation for good policy advice at community, state, national and international levels. CALS activities help inform decision-making by producers, entrepreneurs, consumers and policy makers to enhance the well-being of families and businesses; provide information to help communities cope with change and advance social and economic development; and spur social and economic innovations that benefit individuals and communities.



Photos by Wolfgang Hoffmann BS'75 MS'79

CALS/UW–Extension agronomy professor Joe Lauer (in photo, right) analyzed two decades of data with agricultural economists Jean-Paul Chavas and Guanming Shi to determine the benefits of genetically modified (GM) corn for farmers. The major benefit of GM corn, they concluded, doesn't come from increasing yields in average or good years, but from reducing losses during bad ones—important information for Wisconsin's agricultural economy.



Life sciences communication professor Bret Shaw is partnering with UW–Extension and the Wisconsin Department of Natural Resources to market hunting to new demographic groups, including women and young people. The Hunters Network of Wisconsin, as the initiative is called, is needed to stem a decline in the sport, which has a \$1.4 billion impact on Wisconsin's economy and provides a crucial component to wildlife management recognized since the days of Aldo Leopold. Forest and wildlife ecology professors Tim Van Deelen and Mike Samuel, along with a host of CALS students and alumni, serve as volunteer teachers in beginning hunting classes (shown in photo) that are part of the effort.