

Crop Improvement Extended Towards Crops for Health

Goal: Colorado State University will continue undergraduate education, graduate education, applied research, and outreach in:

- genetics and breeding of cultivars for wheat, potatoes, and dry edible beans focusing on characteristics relevant to pest resistance and climatic conditions of Colorado.
- the improvement of human health attributes of crops via shared planning and purpose with those focused on the Crops for Health initiative.
- evaluating and selecting specialty crops, and appropriate production/marketing approaches for Colorado growers.
- Colorado State University will combine knowledge of phytochemistry, human nutrition and plant genetics to extend crop improvement and dietary intervention with the objective to improve human health and human disease prevention via consumption of these crops and be recognized nationally and internationally as an institution attractive to graduate students in Biomedical Agriculture.
- Crop Improvement Extended toward Crops for Health will include a new graduate education and research focus that will define Biomedical Agriculture as a new discipline.

Purpose: Non-hybrid crop plants require public investment in genetic improvement to provide cultivars which improve yield, resist environmental and pest stresses, and serve the consuming public. Colorado State has a history of providing cultivar breeding for wheat, dry beans, and potatoes to serve the industries in climatic zones represented in Colorado. Additionally, Colorado State has a history of providing crop selection and testing in other agronomic crops and fruits and vegetables to support the development of these agricultural industries in Colorado. In 2007, wheat generated \$607.8 million in commodity sales, dry beans \$20.8 million, potatoes \$181.5 million, and other agronomic crops and vegetable and fruit crops generated \$1.17 billion, in Colorado. The value of these industries to the Colorado economy through other related economic activity is at least double these combined amounts. Molecular biology presents new opportunities to extend the selection and improvement of Colorado crops to incorporate improved human nutritional characteristics. Colorado State University is in a strong position to assist with the economic development of Colorado's agricultural industry and to enhance the public health of citizens with research and education to:

- Improve crops which resist environmental and biological pests, increase price and lower cost of production
- Enhance the success of small-acreage producers who will meet the growing demand for locally produced fruits and vegetables grown organically.
- Incorporate higher human nutritional values of food crops
- Educate agricultural industry, governmental, and academic professionals in the principles of crop selection and improvement.

Molecular biological science provides opportunities to extend the selection and improvement of Colorado crops to incorporate improved human nutritional characteristic. The quantity and quality of the foods we eat have a dramatic impact on the current epidemic of metabolic diseases, e.g., cardiovascular disease, Type 2 diabetes, cancer, and obesity. Metabolites are biochemical compounds that carry out the business of cells in all organisms. Metabolites (like lipids and antioxidants) present in food and in the human body are critical to understand the development and prevention of metabolic disease. Metabolomics is the comprehensive analysis in which all of the metabolites of an organism are identified and quantified. Colorado State has invested in building the capacity to be a leader in discovery research in metabolomics by establishing an interdisciplinary research consortium to determine relationships between metabolites and disease, and to identify metabolites in animal and crop foods to help prevent disease and improve health. Colorado State University is in a strong position to assist with the economic development of Colorado's agricultural industry and to enhance the public health of citizens through research to improve crops by understanding and enhancing their human nutritional food value.

Strategic Actions:

- Identify and formalize the organization of specific "teams" to address the various areas of the initiative.
- Recruit more graduate students and post-doctoral fellows supported by grants and check-off resources.
- Add faculty positions (one an endowed chair) in plant chemistry, plant biochemistry, food chemistry and molecular genetics (metabolomics/genomics) of novel nutritional traits.
- Enhance marketplace opportunities for Crops for Health.
- Develop a proposal for graduate degree in Biomedical Agriculture.
- Pursue international connection and collaboration with Canada.

- Hire a coordinator to “drive” the areas of emphasis within the initiative.
- Secure new space for new faculty and additional lab space for existing faculty and programs.

Critical Resource Growth Needs:

- Secure substantial grant support for fundamental research linking human nutrition to the development of food crop improvement, including special/competitive opportunities.
- Secure funds for four faculty positions, including one endowed chair in the area. These include: one in plant biochemistry, one in molecular genetics, one in food chemistry and one in plant chemistry; all with responsibility to establish a research program to clarify, and more fully commercialize, the mechanisms whereby metabolites confer health-promoting attributes to dry bean, potato and wheat cultivars.
- Shepardson building renovation and labs.
- Secure funds for new space for new faculty and additional lab space for existing faculty and programs.
- Fund a coordinator position for strategic initiative.
- Secure funding for facilities at off-campus research centers, primarily San Luis Valley and Western Research Center.

Personnel:

Administrative Advisors: Gary Peterson, Steve Wallner

Steering Committee Chairs: [Henry Thompson](#) and [Mark Brick](#)

Steering Committee Membership: Scott Haley, David Holm, Frank Stonaker, Horst Caspari, Mike Bartolo, Jerry Johnson, Greg Graff, Pat Byrne, Chris Melby, Jan Leach