BREEDING BETTER BEANS

Edible beans like kidney, pinto, black, lima, pole, wax, and green beans are widely grown and in high demand across the U.S. Beans are an affordable source of protein, fiber, iron, folate, and other micronutrients. Beans also promote soil health and require less nitrogen fertilizer than many other crops.

Researchers at Agricultural Experiment Stations nationwide are working together to develop high-yielding bean varieties with enhanced culinary and nutritional qualities and resistance to stressors like pests, diseases, and drought. These varieties will help farmers use resources efficiently, reduce chemical use, and increase yields, helping to improve the profits and competitiveness of U.S. bean growers and reduce impacts on the environment.

Benefits of the Multistate Approach

- Communication among bean researchers improves study design and facilitates sharing of samples, data, and tools. This makes research more efficient, accelerates progress, and avoids duplication of work.
- Field screenings, diversity panels, databases, and analyses at multiple universities enable discovery of genes and molecular markers for breeding.
- Access to nurseries, greenhouses, and fields nationwide accelerates testing. For example, a winter nursery at the University of Puerto Rico, Isabela Station, held over 5,000 breeding lines from Michigan State University, the University of Nebraska, North Dakota State University, and the USDA-ARS in 2020.
- A multidisciplinary, multistate team makes it more likely that findings will have far-reaching impacts.

Researchers are developing safer, more effective ways to control bean diseases and new bean varieties that tolerate harsh environmental conditions.

University of Nebraska researchers were among the first in the nation to test environmentally-friendly alternatives to copper-based compounds for managing bacterial diseases in dry beans, which are now used by many growers. University of Nebraska researchers are also evaluating new fungicidal products and application methods for root diseases, rust, and white mold.

Analysis of international beans gave researchers new genes to incorporate in U.S. varieties to provide broader resistance to pathogens. Adoption of resistant varieties may reduce fungicide use by 25% or more, lowering costs for growers and reducing human and environmental health risks associated with improper use.

Researchers at the University of Delaware, University of Nebraska, University of Puerto Rico, and University of Wyoming developed bean breeding lines that are resistant to drought, heat, and flooding.

Bean growers can now use fewer inputs.

Project findings have led to increased adoption of bean varieties that require less nitrogen and phosphorous fertilizer, which could help reduce runoff and greenhouse gas emissions.

Research revealed beans' health benefits.

University of Nebraska scientists showed that pinto beans can help lower cholesterol. Colorado State University research found that beans contribute to weight loss and reduction of visceral fat. Other scientists found that beans can reduce inflammation, which is tied to heart disease. Findings help public health officials set dietary recommendations and develop educational materials. Showing that beans are a functional food will also likely lead to higher sale prices for growers.

Iowa State University researchers assessed bean consumption patterns, which shed light on ways to increase bean consumption.

Research has led to beans with more nutrients, better color, and other desirable qualities for consumers and processors.

Researchers identified genomic regions in black beans that contribute to color retention after canning, and Cornell University scientists developed kidney beans with better shape and size. These qualities are important to consumers.

Researchers developed varieties with uniform maturity and faster cook times, which makes the canning process more cost-efficient.

North Dakota State University scientists developed pinto beans that do not darken as quickly after harvest, giving them a more appealing color. The new varieties are also faster cooking and higher in iron and have better bean size and yield than previous slow-darkening varieties. These qualities are appealing to consumers and growers.

Research is also guiding the production of healthy, bean-based foods.

Scientists at Michigan State University and the University of Nebraska showed that bean pastas have more protein and minerals than wheat pastas, and 36% of surveyed consumers would purchase bean pastas.

Researchers at Colorado State University, Oregon State University, University of Wisconsin, University of Wyoming, and Washington State University are involved in the development and testing of popping beans, which have potential to be a convenient, healthy snack food.

Project members shared findings in presentations, grower meetings, field days, workshops, websites, and publications.

In North Dakota and Nebraska alone, Extension educators reached about 1,000 bean growers over the last five years.

A 2019 manuscript showing the efficacy of copper-alternatives will likely be highly referenced and serve as a baseline for future research. Findings were also shared in news media, reaching over 25,000 readers.

W3150: Breeding Common Bean for Resistance to Abiotic and Biotic Stresses, Sustainable Production, and Enhanced Nutritional (2015-2020) was funded in part by the Multistate Research Fund through USDA-NIFA and by grants to project members at participating institutions: University of Arizona, University of California-Davis, University of California-Riverside, Colorado State University, Cornell University, University of Idaho, Iowa State University, Michigan State University, University of Minnesota, Mississippi State University, University of Nebraska, North Dakota State University, Oregon State University, University of Puerto Rico, Washington State University, University of Wisconsin, University of Wyoming. In 2020, W3150 was renewed through 2025. **Learn more:** *bit.ly/W3150*