USA Dry Pea & Lentil Council

APA American Pulse Association

US Dry Bean Council

Pulse Health Initiative Strategic Plan

Executive Summary

Overview

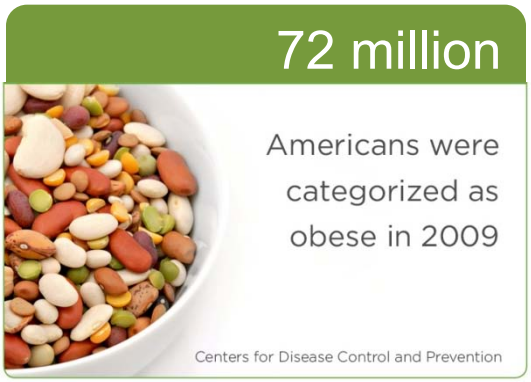
What is a "Pulse" Crop?

The word comes from the Latin word "puls" which means "thick soup." Pulse crops are in the legume family of plants and are defined by the United Nations/Food Aid Organization as dry beans, dry peas, lentils, and chickpeas.

How Can Pulse Crops Fit Into a Healthy Diet and Disease Prevention?

Healthy eating has always been important for proper body growth and development, but more recently, a healthy diet has been accepted as also playing a significant role in reducing the risk of nutrition-related health problems such as obesity, heart disease, cancer, diabetes, hypertension (high blood pressure), osteoporosis, anemia, and some bowel disorders. As a fundamental source of dietary fiber, protein and starch, pulse crops provide outstanding health and nutritional benefits that not only contribute to a healthy lifestyle, but can also help reduce serious health problems.

One of our nation's most significant health-related problems, obesity, has been identified by the Centers for Disease Control and Prevention (CDC) as a contributing factor to several leading causes of death, including heart disease, stroke, diabetes, and some types of cancer. In 2000, the CDC estimated that the year's 300,000 obesity-related deaths cost the national economy more than $117 million and in 2009, an astounding 72 million Americans were categorized as obese.

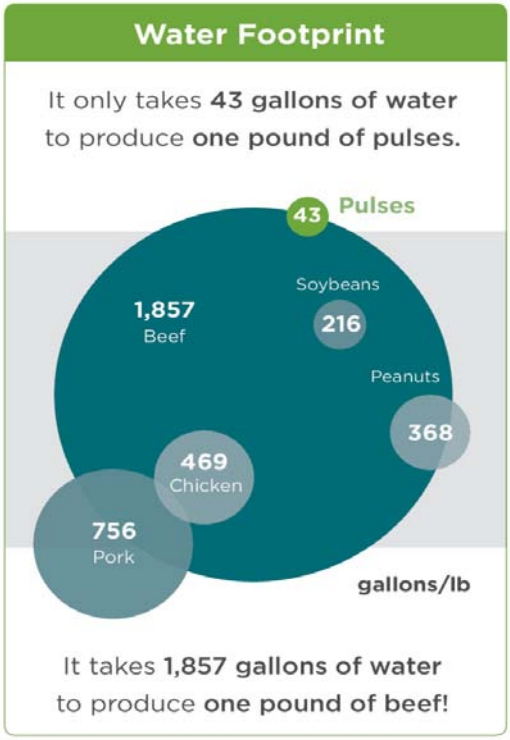


As an excellent source of high fiber, low-fat and high protein, pulse crops can play a significant role in combating obesity by helping Americans reduce daily caloric intake and maintain a healthy diet due to their. Additionally, emerging research has shown that dry peas, dry beans, lentils and chickpeas are high in nutrients like folate. Research indicates that the consumption of foods high in folate can help prevent the risk of heart disease – the leading cause of death in the United States.

However, while the existing research of dry peas, dry beans, lentils and chickpeas is certainly valuable, it is just the tip of the iceberg. There is much more to be studied in pulse crops in order to unlock their full potential for preventing nutrition-related health problems that plague our nation.

What Role Can Pulse Crops Play in Alleviating Global Hunger?

As the global population is expected to increase to 9 billion by 2050, the need to create dependable food sources that offer high nutritional value at low cost has never been greater.



This creates tremendous pressure to produce more food on fewer acres. Agricultural systems are not only expected to provide food, feed, fiber and fuel for a growing world population, but to do so with shrinking agricultural land base and finite water resources.

As a low-cost, non-perishable, easy to produce source of fiber, protein and starch, pulse crops are uniquely positioned to help provide highly nutritional food to more of the world's growing population.

What Role Can Pulse Crops Play in Enhancing Sustainability?

Pulse crops can be an integral component in designing sustainable production systems to effectively utilize limited land and water resource as they require relatively low levels of water (i.e., can be grown in areas with limited rainfall) while producing high levels of dietary fiber, protein and starch on each acre they are planted. Thus, adjusting crop rotations and land use to include more pulses has the potential to increase farm level profitability, enhance sustainable agricultural production systems and potentially reduce the damage to environmentally sensitive production regions.

The Pulse Health Initiative

To help raise awareness and increase research efforts around these issues, the American Pulse Association (APA) created the Pulse Health Initiative (PHI) – a focused effort to increase and leverage scientific research on the advantages of certain pulse crops such as dry beans, lentils, chickpeas and dry peas.

As an initial step, the PHI has developed a Strategic Plan that outlines science-based solutions to health, nutrition and sustainability challenges facing our country and around the world by utilizing these specific pulse crops in appealing and convenient forms. The following is an overview of the PHI and its goals, the economic impact of pulse crops and APA's recommendations for increasing scientific research and awareness around the benefits of pulse crops.

The Pulse Health Initiative - Goals

In March of 2010, 52 experts (see Appendix 1) within the food and crop production industries and scientific research communities convened to develop short- and long-term research priorities as well as specific long-term goals related to pulse crops in the areas of health and nutrition, sustainability and functionality/end-use.

Obesity and Chronic Disease Priorities: Identify ways that pulse crops can help reduce obesity and help provide solutions to critical nutrition, health (i.e., diabetes, cardiovascular, cancer, etc.).

Strategic Goals

- Obtain funding for research that demonstrates the role of pulse crops in reducing obesity and providing solutions to critical health issues.

- Establish optimal recommended dietary consumption levels of pulse crops.

Global Health and Functionality Priorities: With their many benefits, pulse crops can play a critical role in reducing global hunger and improving global food security. They are an acceptable part of the diet in almost every culture around the world.

Additionally, as new uses can be found for the functionality of pulse crops – such as flours, or as ingredients – they can be used to provide greater nutrients and protein in more foods. This can take place through the study of milling, extrusion and extraction of the starches, fibers and proteins as well as the cooking properties in baked goods, noodles, snacks, meat analogues and extenders, egg replacements, beverages and other food items.

Strategic Goals

- While domestic pulse crop production has increased over the past few decades, agronomic research could help increase global pulse crop yield by 30% over the next 20 years.

- Secure funding to demonstrate that increased knowledge in functionality and end-use of pulse crops would result in nutritious and low-calorie foods.

- Increase knowledge about the use of pulses among the general public, entrepreneurs and the food industry through demonstrations and customized training sessions.

Sustainability Priorities: Demonstrate the role pulse crops can play in helping to address global environmental challenges in agriculture on a cost-efficient basis. Globally, improvements in productivity of pulse crops will be significant for food security.

Strategic Goals

- Obtain funding for research to demonstrate that an increase in utilization of pulse crops in crop rotations can help reduce agriculture's carbon footprint around the world.

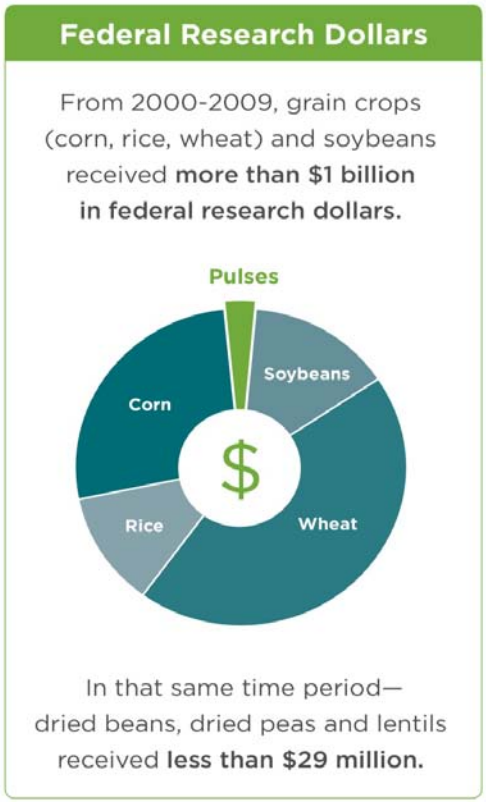
- Obtain funding for research to demonstrate that adding more pulse crops to farming systems can reduce water usage for global food production.

The Pulse Health Initiative – Recommended Areas for Additional Research

While pulse crops hold many known benefits, additional research is necessary to further analyze the health benefits of pulse crops and determine a scientifically-based recommended consumption level. Additional research can also ascertain the environmental impact of pulse crops. There are three areas in which APA believes additional research is required:

- **Obesity and Chronic Disease - $10 million:** Pulse crops are functional foods packed with nutrients and healthy phytochemicals, however, more research is needed to quantifiably substantiate the role pulse crops can play in reducing obesity and providing increased health benefits. Additional mechanistic data is also necessary to establish the recommended consumption levels and provide their overall true impact. Equipped with this additional information, improvements in health benefits can be made through the management of pulse crops, enhancements in handling and improved variety selection.

- **Global Hunger and Functionality – $7 Million:** Improved breeding techniques can help to increase the yield and nutritional traits of pulse crops. Currently, there is insufficient scientific research to promote the development of new products or new functionality for pulse crops. New functionality could require the development of additional traits such as increased protein or improved nutrients that would need to be developed for the industry.



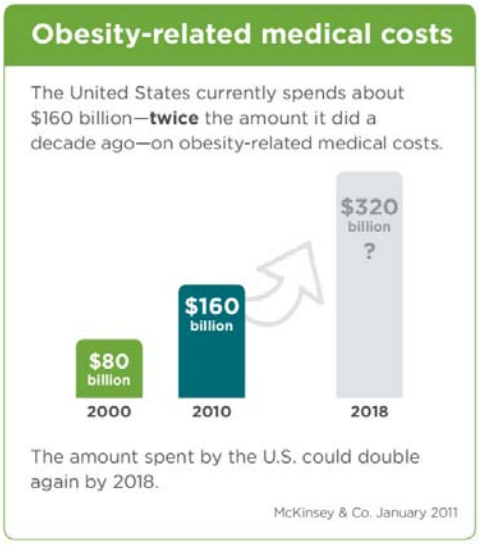
- **Sustainability - $8 Million:** Sustainability in agricultural systems includes both environmental and economic factors. The benefits of nitrogen fixation (obtaining nitrogen from atmospheric sources) and low water use in legumes are not well documented. They are difficult to measure and even more difficult to predict. Improvements in understanding these relationships will help to measure the impacts of agricultural systems with pulses, both economically and environmentally. Development of pulse crop varieties with specific health benefits or environmental enhancements require the improvement of basic genetic information to be successful. Economic research that evaluates the costs and benefits of enhanced sustainability on farms and in farm communities across the nation is also necessary.

The Pulse Health Initiative - Economic Impact of Pulse Crops

Increasing the production and consumption of pulse crops also offers potential areas of positive economic impact.

Because pulse crops are a low-cost source of dietary fiber, protein and starch, increased consumption can reduce overall food costs, enhance farm profitability and sustainable agriculture practices, as well as create U.S.-based jobs. Specific economic impacts of pulse crops include:

- **Reduced food costs:** Pulse crops are a low-cost source of dietary fiber, protein and starch and therefore, increased consumption of pulse crops may help reduce the cost of food for consumers. Pulse crops offer a wide variety of food consumer food choices from hummus to chili.
- **Improved sustainable agriculture production systems:** In addition to their high nutritional value, pulse crops can be grown in areas with limited water supply. Therefore, adjusting crop rotations to include more pulse crops can improve farm profitability, enhance sustainable agriculture production and reduce the negative impact on environmentally-sensitive production regions.
- **Increased employment opportunities:** Pulse crops grown in the United States provide economic benefits to the farmers who grow the crops as well as the businesses who process and distribute the crops both domestically and internationally, creating more U.S.-based jobs in rural and urban areas.
- **Indirect health care cost reductions and productivity savings:** As an excellent, low-fat source of dietary fiber, protein and starch, pulse crops can play a tremendous role in a healthy diet. Maintaining a healthy lifestyle can significantly help to improve quality of life and reduce health care costs. It also leads to greater worker productivity by reducing medical leave.



The Pulse Health Initiative – Increasing Awareness

Following are APA's recommendations to help raise awareness of pulse crops and their beneficial attributes in the areas of health and nutrition, sustainability and functionality/end-use:

- **Educate members of the food industry** through short courses and training programs on the utilization of pulse crops and pulse ingredients in food products, as well as how pulse crops can lower costs within the retail and commercial food industry.
- **Educate policy makers as to the health, sustainability and economic benefits** – both domestic and international production and markets for pulse crops.

- **Educate end-users** (school systems, chefs, consumers, etc.) through training sessions on the health benefits of pulse crops and pulses in food products and meal choices.

- **Develop a website** to educate and provide updated information on pulse crops to key audiences including growers, processors, food and restaurant industries, teachers and consumers.

- **Conduct outreach to key targets** in the media (print, radio and broadcast) and within scientific/non-scientific organizations that focus on food, nutrition and technology, to promote the utilization of pulse crops as food and ingredients.

Summary

Pulse crops are an essential part of improving our food security and agriculture systems around the world. Their ability to produce high levels of fiber, protein and starch while using limited land and water resources, coupled with their nutritional and environmental benefits, create a cost-effective food crop that has the potential to help us maintain an overall healthier lifestyle and also provide solutions to critical nutrition and health problems facing the nation such as obesity and heart disease.

However, while initial research has shown that pulse crops are highly nutritional and environmentally-friendly, they remain neglected scientifically. Additional research in the areas of health and nutrition, sustainability and functionally/end-use is needed to provide accurate consumption level recommendations and to explore additional health benefits of pulse crops.

The Pulse Health Initiative Strategic Plan that follows not only showcases the nutritional and health benefits of pulse crops, but also identifies ways that they can begin to help solve some of the current challenges we face throughout the U.S. and around the world.

##

APPENDIX 1

The planning session was facilitated by the following individuals:

Health and Nutrition:

- Dr. Gerald Combs, Research Leader, USDA-ARS Human Nutrition Center, Grand Forks, ND
- Dr. Michael Grusak, Plant Physiologist, USDA-ARS Children's Nutrition Research Center, Houston, TX

Sustainability:

- Dr. George Vandemark, Plant Geneticist and Research Leader, USDA-ARS Grain Legume Research Unit, Pullman, WA
- Dr. James Kelly, Professor and Plant Breeder, Michigan State University, Lansing, MI

Functionality/End Use:

- Dr. Jose de Berrios, Food Science Engineer, USDA-ARS Western Regional Research Center, Albany, CA
- Dr. Mehmet Tulbek, Technical Director, Northern Crops Institute, Fargo, ND

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Gary	Weaver	University of New England
Irvin	Widders	Michigan State University
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2010 APA Pulse Health Initiative Funding Matrix

Improving Global Health through Pulse Crop Research

Condensed layout of the proposed funding for the Pulse Health Intiative Strategic Research Plan developed during the Research Planning Workshop organized by the American Pulse Association in March, 2010

American Pulse Association
1/28/2011

PHI Nutrition & Health Program Area-$10 Million

Research Project	Research Goals	Types of Research	Component Expertise	Funding	Priority
Roles of Pulse Foods in Preventing Chronic Disease	1. Determine impact of consuming pulse-foods on key health endpoints (glycemic control, cardiovascular risk factors, weight management) (using market basket). 2. Develop sustainable programs to prevent obesity (targeting children) using pulse foods.	Clinical trials with human volunteers	Clinical nutrition, dietetics; metabolism; health surveil-lance; body composition analysis; community nutrition; behavior; consumer/health economics	50%	1
Consumer Needs for Pulse Foods	1. Determine barriers & facilitators of pulse consumption (US , ex-US). 2. Characterize pulse consumption patterns on consumers (US and key foreign markets). 3. Develop pulse “market basket”.	Consumer surveys; focus groups; secondary analysis of existing data	Consumer behavior; epidemiology; consumer economics; consumer surveys; dietetics	10%	2
Bioactive Components of Pulse Foods	1. Identify biomarkers of intake for various pulses. 2. Validate biomarkers in humans. 3. Identify bioactive components and relevant plant genetic components of pulses. 4. Evaluate prospective bioactive components in relevant model systems (cells, animals).	Biochemical analyses; studies with cultured cells; studies with rodent models; short-termed feeding studies with human volunteers; quantitative genetic analyses of defined plant populations	Biochemistry; molecular biology; analytical chemistry; clinical nutrition; dietetics; metabolism; cell biology; plant physiology; plant genetics	20%	3
Epidemiology of Pulse-Health Relationships	1. Evaluate the health effects associated with regular pulse consumption (weight management, glycemic control, cardiovascular risk factors). 2. Determine whether responder/non-responder sub-groups may occur.	Epidemiological (cross-sectional and cohort) studies; analyses (allele variation) of target genes in human sub-groups	Epidemiology; clinical biochemistry; clinical nutrition/dietetics; clinical biochemistry; molecular biology	20%	4

PHI World Hunger & Functionality/End Use-$7 Million

Research Project	Research Goals	Types of Research	Component Expertise	Funding	Priority
Nutritional Quality of Pulse Crops	1. Determine factors affecting nutritional quality of pulse crops. 2. Identify new agro-ecological growing regions for producing nutrient dense pulses. 3. Develop pulse varieties with improved nutritional characteristics.	Field trials; soil mineral analyses; in vitro activity assays; gene discovery; seed composition analyses; greenhouse/ growth chamber studies.	Agronomy; analytical chemistry; biochemistry; food science; genetics; microbiology; molecular biology; plant breeding; soil science.	30%	1
Develop convenient, healthy, appealing, super food products with pulses	1. Utilize current, new and innovating processing technologies to reduce cooking time, flatulence factors, beany and bitter flavors on foods made with pulse. 2. Optimize processing conditions and formulations to improve the acceptability, nutritional and health attributes of foods made with pulse. 3. Develop healthy, ready-to-eat pulse-based foods tailor for children and the general public to reduce obesity and global hunger and enhance food security.	Physical, chemical, functional and nutritional analyses; in vitro studies; studies to test for allergens; studies with rodent models; flavor analysis, sensory studies; commercial acceptability surveys; scale-up studies	Extrusion technology; microwave and infra red technology; analytical/food chemistry; biochemistry; food science; sensory evaluation; consumer behavior/economics.	20%	2
Evaluate the functional properties of pulses and their fractions for use as food	1. Evaluate functionality and nutritional profiles of pulses and their fractions to identify cultivars with greater potential as food. 2. Assess the functional, chemical, and nutritional changes that occur in pulses due to preparation methods and agronomic practices. 3. Develop database of fundamental information on functionality of pulses to assist the food industry, health/nutrition and sustainability groups.	Physical, chemical, functional and nutritional analyses; in vitro studies; milling studies; cooking tests; sensory studies	Analytical/food chemistry; biochemistry; food processing; food science; sensory evaluation.	20%	3

PHI World Hunger & Functionality/End Use-Continued

Utilization of vegetable protein and other healthy ingredients of pulses in novel foods	1. Identify and develop technologies and methods to fractionate, separate, and concentrate pulse proteins, starches and dietary fibers 2. Evaluate functional properties of protein and other pulse fractions and optimize their use in food applications. 3. Develop healthy, allergen free foods and beverages rich in protein and bioactive components from pulse fractions.	Physical, chemical, functional and nutritional analyses; in vitro studies; allergen testing; studies with rodent models; flavor analysis, sensory studies; consumer acceptability surveys; scale-up studies	Size reduction technologies; fluidizing, homogenization, centrifugation, and filtration technologies; extrusion technology; analytical/food chemistry; biochemistry; food science; sensory evaluation; consumer behavior/economics.	20%	4

PHI Sustainability Program Area-$8Million

Research Project	Research Goals	Types of Research	Component Expertise	Funding	Priority
Factors Impacting Pulse Production	1. Develop integrated methods to reduce pulse crop losses to disease, pests, and weeds. 2. Improve the efficiency of water usage in pulse-small grain cropping systems. 3. Expand range of domestic pulse production.	Disease and pest resistance screening; cropping system studies; field trials; studies with cultured plant and microbial cells.	Agronomy; biochemistry; hydrology; molecular biology; plant breeding; plant pathology; weed science.	45%	1
Roles of Pulse Crops in Sustainable Agricultural Systems	1. Develop pulse cropping systems that reduce greenhouse gas production. 2. Improve soil health and resources through pulse crop production. 3. Increase benefits to organic management systems from pulse crops.	Cropping system studies; field trials; remote sensing; chemical and microbial analysis of plants and soil.	Agronomy; analytical chemistry; decision analysis; economics; microbiology; plant pathology; soil science.	35%	2
Biological Nitrogen Fixation (BNF) in Pulse Crops.	1. Identify and develop pulse varieties that fix more nitrogen and leave greater residual nitrogen in soil. 2. Develop strains of rhizobia with superior nitrogen fixation (BNF) in pulse crops. 3. Determine factors influencing plant-rhizobia interactions.	Biochemical analysis of plants; gene discovery, isolation and characterization; greenhouse and field studies.	Agronomy; genetics; microbiology; molecular biology; plant breeding; plant physiology; soil science	20%	3