Give Peas a Chance

The case for more pulses in the field and on the plate

healthy people healthy planet
BEANS · PEAS · LENTILS

Pulse Canada

"Let food be your medicine and medicine be your food"

Hippocrates, 5th C BC

1. Introduction

The year began with a hangover. Not from a great party the night before, but from a realization that the world's economies were in recession and the banking system needed major repair. On top of that, climate change represents a huge, unresolved long-term threat.

The food industry is facing its own problems. A global health crisis of obesity and malnutrition means an overhaul of production, processing and consumption is required. The challenge includes tackling the environmental impact of agriculture and horticulture, as well as the social cost of over eating processed foods high in fat, sugar and salt.

This paper proposes practical solutions. It's about pulses and how they offer improved sustainability in the field and on the plate. Peas, beans, lentils and chickpeas, known as pulses, are the dried seeds of plants belonging to the legume family, which gets its name from the characteristic pod that protects the seeds while they are forming and ripening.

If you're a farmer or trader of pulses, you will find a broader context for your work. If you're in the food industry, perhaps in marketing or innovation, you'll find ideas to help review your ingredient usage. If you're involved in food or health policy, you'll know pulses should be a growing part of a balanced diet. You'll also find out that they're good for the environment.

The emergence of so-called "superfoods" has resulted in a flurry of regulations around the world to make health claims for exotic berries, juices and even grasses. However, it's already well established that more pulses on the plate would have positive health outcomes for heart disease, diabetes and obesity. More pulses in the field would also have a positive effect on climate change. The environment wins because of the ability of pulses to make their own fertilizer from the very air that we breathe. This desirable habit results in high levels of protein, which have always made them an invaluable part of our diet.

A good human diet is a balanced one, so this paper recommends an increase in the consumption of pulses. If that happens, and more pulses are eaten, the resulting health and carbon credit would be massive.

If more pulses are eaten, more will be grown.
That's great news for health and the environment.

Table of Contents

Three pulse facts

1. Pulses are higher in protein than most other plants at about 25%. (Wheat is about 12%).
2. Pulses have a low glycemic index. This means their carbohydrates are mostly fibre and starch that prevent blood sugars from rising quickly after eating.
3. Pulses take nitrogen from the atmosphere through root nodules, which allows farmers to use less manufactured nitrogen made from fossil fuels.

Simple, nutritious and affordable

Pulses are a staple in many markets and are included in every meal. Rice and beans, falafel, hummus and dal are all examples of traditional pulse recipes at the heart of family and cultural life in Latin America, North Africa, the Middle East, Pakistan, India and Bangladesh. In such countries, people still take time to cook and eat together. The health outcomes prove the benefits of including plenty of pulses in the diet and cooking from scratch.

2.Trends

Change is happening. Leading farmers are building a sustainable approach. Food manufacturers are reviewing their range of ingredients, both for sustainability in the field and for positive nutritional results on the plate. There is an emergence of new business alliances to understand sustainability. Public health policy makers are driving improved diets and more exercise. Yet, in rich and poor countries alike, the health crisis is deepening.

2.1 Food production is changing in response to the market

Every year, the G8 leading nations meet to discuss issues of mutual concern. In April 2009, the organizing country, Italy, released a communiqué about global food security. It called for "increasing public and private investment"[1]. The UN's Food and Agriculture Organization (FAO) had told the G8 that for 2009 the number of chronically hungry people was set to rise by up to 100 million, bringing the total number to more than 1 billion. Also that April, the World Bank's Global Monitoring Report argued that with immediate and concerted action the first Millennium Development Goal, of halving the number of people living in extreme poverty by 2015, can be achieved. In order to deliver on this global imperative, it stresses the urgent need to invest in agriculture.

Meanwhile, the growers of commodity crops face a new challenge. It's not enough just to produce a silo full of grain, oilseeds or pulses. The silo has to be full of a product that has been grown sustainably, with a win for consumers, the environment and companies. Quality has become more than dry matter and protein content.

The ethical shopper, in spite of the recession, continues to be a significant driver of change for mainstream food production. Farming has long been production driven, but the required change to becoming market driven is now evident. For example, an initiative in the U.S. called "Field to Market, the Keystone Alliance for Sustainable Agriculture,"[2] is working on understanding best practice in the field, identifying how to measure it and building a dialogue to support the development of sustainable production systems. The evidence for the trend is in the very name of the initiative and in the long list of leading companies in the alliance.

Some leading retailers and brand manufacturers have developed environmental programs with their suppliers while many others are working out how to get engaged. In fields around the world, there is an emergence of a drive for better understanding of soil health with improved rotations, less tillage and continuous improvement of carbon and water footprints. This will create opportunities further along the supply chain for building awareness of the environmental and health outcomes of agriculture.

2.2 Looking for a shared approach

In business, leadership is usually at the heart of the reasons for both success and failure. In January 2009, the world's leading retailer, Wal-mart, had a change at the top. The new CEO, Mike Duke, chose sustainability as his first subject when he talked to his team. He said: "You will see that the leaders that get ahead in Wal-Mart will be the ones who demonstrate their commitment to sustainability. You won't be able, in the future, to be viewed in the same way if you put this on the back burner."

Duke's message will have an impact on every leader at Wal-Mart. Some may be looking at how they build and manage their stores. Others will look at how the food they sell is grown and consumed. This brings us to the expectation from consumers and stakeholders that the food business must be proactive on such issues.

Production Case Study:

John Bennett, Saskatchewan pulse grower

On the prairies of Western Canada, sustainability has become a way of life.

John Bennett and his wife, Shirley, farm south of Biggar, Saskatchewan.

"I farm 1,600 acres and I'm the fourth generation of my family to look after this land. I grow wheat, barley, canola, flax, mustard and canary seed. More especially, I grow peas and lentils. Over the last 20 years, I've dramatically changed the way I farm. I had no choice because we had a big problem with water and wind erosion and something had to be done.

First of all, I was looking to create a good crop rotation. I needed diversity. Pulses are a wonderful fit, in part because of their natural nitrogen fix where the value comes twice - once into the actual crop and again into the one that follows. That means I use less 'manufactured' nitrogen[3]. There's more to their importance for soil health, but it's difficult to put a figure on this. Scientists say pulses give a certain amount of extra nitrogen. Around here, we talk about something we call 'pea magic'. What we see is yield advantages that are difficult to explain. There are countless microbes in the soil and they all have different needs for nutrients. The pulse crop seems to provide a microbial boost – it's all to do with making nutrients available.

My other main innovation was to be one of the first farmers to put away my ploughs and harrows and try something different. Now I guess that over 90% of the farmers in my area do the same. We call it "direct seeding", but others talk about "zero till". I believe there are now over 24 million acres (10 million hectares) in Western Canada alone of land farmed in this way. This has transformed prairie agriculture and, for me, pulses are the key enabler. Their contribution to soil health on my farm is very significant.

To start with, our conservation effort was about stopping problems like erosion, organic matter depletion and soil salinity. We stopped the soil blowing away, made better use of our rainfall, improved the wildlife habitat and stored a lot of carbon in the soil. The business win, which often seems to be the case with sustainability, was unexpected. Our productivity has improved. My returns for the pulses are variable. Overall, they are probably less than wheat. But their value to me is more than dollars – they enable the way I farm. I see them as a part of a sustainable agricultural system. I love the soil. If you get down to the real fundamentals, soil health represents the future of the planet."

John has been active in the Saskatchewan Soil Conservation Association since its foundation and is a past president. The 800 active members share best practices and look to build understanding of soil health. They also work to influence national policy. Part of their work has been to look at the issues around 'carbon sequestration' in the soil. Put simply, in agriculture there is a natural process that sees carbon transferred from the atmosphere and stored in the soil, as long as the soil remains undisturbed. Canadian cropland can sequester about 22 million tonnes of atmospheric CO_2 per year[4] by using current best management practices[5].

2.2 Looking for a shared approach – continued

The response from the leaders is evident. Gene Kahn, the Global Sustainability Officer for General Mills, speaking at the Food Marketing Institute's first Sustainability Summit in 2008[6], pointed out that the U.S. food industry accounts for just 5% of U.S. energy use, but 18% of greenhouse gas emissions and a very substantial 82% of water usage. His recommendations for business included both creating and rewarding a culture of sustainability while promoting innovation.

In Europe, the food industry has also been building its approach. Firstly, the retailers in partnership with the European Commission started their Retail Forum. Their aim is to contribute to the European Commission's 'Sustainable Production and Consumption Action Plan', launched in 2008[7]. Secondly, the 'Food Sustainable Consumption and Production Roundtable' is looking at understanding and promoting environmental sustainability. It will be led by trade associations representing farmers and their suppliers, food manufacturers, packaging producers and the logistics operators.

Again, the trend here is in the title of both initiatives. The two major players in the food industry - the retailers and the brand manufacturers - are working together to set sustainability expectations in the field and on the plate. There is a new accountability that is moving towards companies, driven by the ethical consumer who is prepared to reward the leaders.

2.3 Public health policy – the poor are now fatter than the rich[8]

The WHO provides leadership on global health policy[9]. Their communication focus is on building awareness of the foods that are really causing the problems and also on building a general message about the overall quality of the diet. They don't name particular foods. After all, the problem isn't the steak, cake or pie, it's the person that eats too much of them.

As the evidence of unsustainable consumption patterns in developed countries grows, so does the need to find public health policies that will help address the problem. As these nations get richer and life expectancy grows, the diseases of poverty decline, such as tuberculosis or dysentery. Meanwhile, the diseases of affluence grow, such as Type 2 diabetes and cardiovascular problems. They're strongly linked to unbalanced diets. Ironically, in developed countries, these diseases of affluence are now far more likely to affect the poor than the rich.

In poor countries, the growing trend is for energy imbalance. The increased consumption of unhealthy foods compounded with higher levels of obesity is typically referred to as the "Nutrition Transition[10]." At the heart of this is the demand for higher consumption of meat and dairy combined with reduced consumption in grains, pulses, fruit and vegetables. This transition sees an increase in eating away from the home and falling costs of strongly marketed, energy rich foods such as pizza and confectionary.

Diet and physical activity: a public health priority
The World Health Organization, (WHO) 2009

Healthy diets and regular, adequate physical activity are major factors in the promotion and maintenance of good health throughout the entire life course. Unhealthy diets and physical inactivity are two of the main risk factors for raised blood pressure, raised blood glucose, abnormal blood lipids, obesity and for the major chronic diseases such as cancer, diabetes and cardiovascular diseases.

Their advice is to limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats; increase consumption of fruit and vegetables, as well as legumes, whole grains and nuts; and limit intake of sugars.

Processing Case Study:

InfraReady Products

Simpler, better, quicker pulse cooking -A new approach

Mark Pickard
President,
InfraReady Products

In 1994, a farmer-owned organization called the Saskatchewan Wheat Pool was looking to see how value could be added to their commodities, especially to pulses. Mark Pickard, who grew up on a farm, did the original work that identified the opportunity offered by a combination of adding moisture and applying infrared heat. The process, known as micronization, has clear benefits. It enables reduced cooking times for lentils, peas and beans, giving new opportunities for innovation in the factory and convenience in the kitchen.

Mark started with three people, no products and no customers. They had to develop both the market and the products. Five years later, he took the company private with a partner to form InfraReady Products 1998 Ltd.

"I see innovation as either incremental or transformational. Either way, it's not commercial unless there's genuine customer benefit. As we developed new ideas and increased our range, we found a whole series of advantages. For example, better water absorption, higher water retention, improved shelf stability and better food safety."

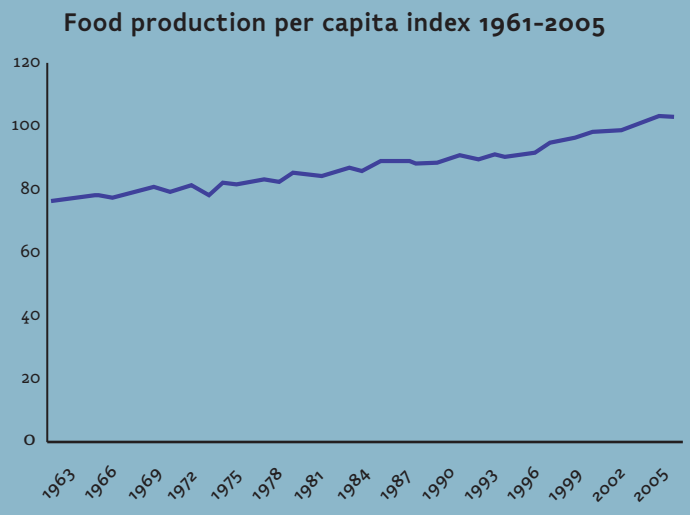
A pre-soaked black bean takes two hours to cook. After micronization, there's no need for soaking and the bean will be ready in an hour or less depending on its form (whole, flakes, powder etc). The market for a quicker cooking pulse has proved extensive.

"As you go to higher altitudes, the temperature at which water boils gets lower. At 8,500 feet (2,600 metres), Bogotá, Colombia is the highest city of its size in the world and water boils at 92 degrees. Pulses such as beans, peas, and lentils are eaten very frequently, especially in soups. Quick cooking pulses are a real benefit to them. Micronized pulses can be flaked or ground for processors to use as versatile ingredients. I see food technologists innovating to create a form that is familiar to consumers but offers the extra benefits of the pulses, such as bread, crackers and dips. I've seen micronized pulse thickeners used to replace modified starch. The product label then has a more natural looking ingredient list. That's important for some consumers."

"Here in Canada, we're a hotbed of activity on pulse innovation; from plant breeding and crop growing[11] to novel utilization in processing. We do need to make sure the health benefits are better understood by consumers, but I believe that the real challenge is to put that positive nutrition into more everyday foods. It's not about changing cultures; it's about improving the health benefits of food recipes."

3. Challenges

Food security means everyone has what they need. One-fifth of the world's population currently eats and wastes too much and another one-fifth suffers from malnutrition. The cost to society is rising. Meanwhile, the world gets hotter as greenhouse gas levels rise in the atmosphere. The food industry must find a new procurement model that will deliver long-term sustainability.



"FOOD SECURITY EXISTS WHEN ALL PEOPLE, AT ALL TIMES, HAVE PHYSICAL AND ECONOMIC ACCESS TO SUFFICIENT, SAFE AND NUTRITIOUS FOOD TO MEET THEIR DIETARY NEEDS AND FOOD PREFERENCES FOR AN ACTIVE AND HEALTHY LIFE".

FOOD AND AGRICULTURE ORGANIZATION (FAO), 2009

Food per person increased during the 1961-2005 period. The y-axis is percent of 1999-2001 average food production per capita.

Data source: World Resources Institute.

3.1 Food security: It's about poverty not hunger

There's more food than ever. The surplus is being eaten by people who've already had enough and is being thrown away by them, too. The FAO tells us there are one billion people hungry through extreme poverty. That's the same reason why a further two billion suffer food insecurity periodically. While steadily increasing food production per person doesn't solve food insecurity on its own, it is a part of the overall solution. Food production's impacts on soil, water, air and land during this same period have also increased. The real challenge will be maintaining this growth of available food per person, while not only stopping the further harm to, but actually improving, the physical environment.

The World Wildlife Fund (WWF) has provided a credible challenge to business for many years. In the 2009 report by their UK team, "One Planet Food Strategy," they say unsustainable populations are those with a higher ecological footprint than available land. They propose that, on the one hand, the developed countries must address their excessive approach to food consumption, while on the other hand, developing countries must be discouraged from going down the same route.

The hungry must be fed. So must the extra two billion humans predicted to join the world population over the next 30 years[12]. This increase is partly due to population growth, but also because people are living longer.

We depend on farmers, especially those in the northern grain belts across the prairies of North America, Europe and Asia. They have the land, soils and climate to produce food on a huge scale. Their challenge is to maintain soil health and stabilize their volumes against market volatility.

3.2 The rising cost of poor diets

On March 24, 2009, The Washington Post had a front page with stories like many other days. The U.S. government was helping bail out the banks. President Obama was being lobbied on climate warming by the Environmental Protection Agency. However, at the top of the page was a story on the first large-scale study about health outcomes from eating beef or pork every day. Over 10 years, the health of 500,000 Americans was studied by the National Institute for Health[13].

"We found an association between red and processed meat and an increased risk of mortality," said Rashmi Sinha of the National Cancer Institute. Barry M. Popkin, Professor of Nutrition at the University Of North Carolina School Of Public Health, wrote an editorial to support the launch of the study. He said "The uniqueness of this study is its size and length of follow-up. If people want to be healthy and live longer, eat less red and processed meat."

A spokesman from the meat industry pointed out that it was all based on self assessment and that livestock production plays a crucial role in rural economies around the world. Walter Willet, a nutrition expert from Harvard School of Health, said that it was about eating a balanced diet, not about becoming a vegetarian. Another quote from Professor Popkin concluded the piece: "There's a big interplay between the global increase in animal food intake and the effects on climate change. If we cut by a few ounces a day our red meat intake, we would have a big impact on emissions and environmental degradation."

It's not just red and processed meat. Growth in the food industry depends on convincing people to eat more. As evidence of this, go into any supermarket and see the special offers. Profit has been delivered by selling strongly-marketed, energy-rich foods, the most cost-effective ingredients being water, fat, sugar and salt. Critics of the food industry can be very blunt. American author and journalist Michael Pollan thinks the solution is to put the focus back on foods and food chains. "Personal health cannot be divorced from the health of the soil, plants and animals that make up the food chains in which humans take part." His advice? "Eat food. Not too much. Mostly plants."[14]

What is the economic burden of diabetes? WHO Fact sheet N°312, November 2008

Diabetes and its complications impose significant economic consequences on individuals, families, health systems and countries. In China, the overall obesity rate is just 5%. However, in the cities this rate is 20%. Over the next 10 years (2006-2015), China will lose $558 billion in foregone national income due to heart disease, stroke and diabetes alone.

3.3 Climate change: Delay or denial no longer an option

Over the last 20 years, the evidence for global warming has built quickly. Action to effectively deal with greenhouse gas emissions has become a global priority for governments and for business. The Stern Review,[15] commissioned by the UK government to assess the economic impact of global warming, was published in October 2006. Within just 550 days, the author of the report revised his estimate because global warming was happening faster than predicted. He raised the cost to 2% of GDP instead of the 1% he had originally identified. He also costed inaction at between 5% and 20% of GDP.

The U.S. Senate Committee on the Environment received a written submission in February 2009 from Nobel Peace Prize recipient, Dr. R. K. Pachauri, Chairman of the Intergovernmental Panel on Climate Change (IPCC). Pachauri said, "Our knowledge of the scientific aspects of climate change clearly establishes the rationale for early action and the benefits associated with it. It also reveals the heavy cost of inaction that human society and all species would have to incur in the form of increasingly serious impacts of climate change. In this context, it would be relevant to quote President Barack Obama: 'Now is the time to confront this challenge once and for all. Delay is no longer an option. Denial is no longer an acceptable response'."

Extensive work by the food industry is already underway as energy use on farm, factory and in distribution is reviewed. The debate on how to deliver the more radical change that is required continues. Discussion around a new understanding of ingredients and responsible purchasing is developing. A new procurement model must consider much more than price.

4. What's been tried so far

To change consumer behaviour and drive sustainable consumption, an approach is required that really makes sense. People can then identify what's in it for them. Health claims without credibility are in need of an overhaul - they don't add value. Sound new clinical findings combined with a new understanding of the environmental issues can provide a trustworthy framework for effective engagement with consumers.

4.1 Consumer education and stealth nutrition

With the growth of the internet, there are many good independent websites ranging from specialist ones on allergens and intolerance[16] through to general ones supported by governments[17]. Every manufacturer and retailer also provides detailed information about their own products.

The quality of information, increasingly on the front of packaging, has also improved. The 'traffic light' system shows the proportions and quantities of the major food groups such as salt, sugar and fat, with 'red' foods leading away from a healthy diet and 'green' foods toward one. The 'guideline daily amounts' system translates science into nutritional information based on percentages and portion sizes. In May 2009, at the European Congress on Obesity, nutritionist Bridget Kelly of the Cancer Council in New South Wales summarized recent consumer research in Australia. "The food industry tends to favour the 'Guideline Daily Amount' approach, but our research indicates that the traffic light system is the most effective and that a consistent labelling approach across all food products is needed. This is unlikely to be achieved without government regulation." The food industry has also done research, providing many studies to show that consumers prefer to work it out for themselves using the percentages in preference to the traffic lights.

Meanwhile, mostly quite unnoticed by the consumers and driven by the ethical consumer and governments, food manufacturers are working to make foods healthier. Salt, sugar and fats are being reduced[18]; cumulatively in huge quantities. So the best improvement may be from stealth nutrition that the consumer doesn't even notice.

However, in spite of all the efforts to inform and educate, many consumers still don't care. New products that are openly marketed as being healthier often fail, leaving the manufacturer with another expensive product development and marketing failure. The consumer won't buy healthy foods unless they are likely to taste good, and be eaten by children. As for treats, they will always be the real thing.

4.2 Health claims and innovation

It's one thing to improve the health benefits of a food through ingredient substitution or adjustments to the formulation; it's another thing to tell consumers about it. Nutrition and health have been long-term drivers for innovation within the food industry. Consumers see the evidence on the labels, with statements about the beneficial effects of consumption such as, 'helps maintain a healthy heart' or 'helps aid digestion'. These are examples of health claims. There are also more general health messages including statements such as 'high fibre', 'probiotic' and 'blood sugar friendly'. The rules for such statements were very general and it has been difficult for consumers to know what was meant. New regulations in Europe and North America are more specific. Health claims about nutrition and health will only be allowed if they are based on science. The European Food Safety Authority is preparing an approved list of health claims for January 2010. By May 2009, they had approved just seven claims, rejected 35 and had around 4,000 left to review[19].

The marketing of food for health is also being targeted specifically to particular age groups. In Asia, marketing for 'seniors' is already popular and is being developed elsewhere. The next innovative step in recipe design would build on the work on reducing salt, sugar and fats by the substitution of ingredients to improve health outcomes, while maintaining taste and quality. An example is the multigrain pasta range marketed in the U.S., "Barilla Plus." It includes flour from lentils and chickpeas that provides a 40% protein boost and contributes to a 100% fibre gain. Genuine health claims and messages that make real sense to consumers will offer a reward to all.

Retailer Case Study:

Hannaford and Guiding Stars

Guide the consumer and let them choose

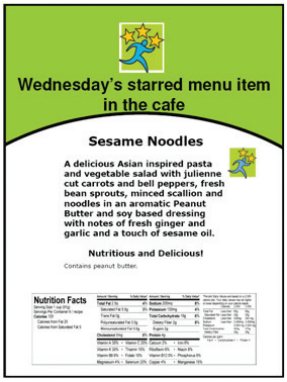
In 2005, the Maine-based retailer Hannaford, part of the international Delhaize Group, did extensive customer research. Consumers wanted to understand nutrition better so Hannaford devised an innovative approach. Instead of the perceived negativity of a traffic light system rating the proportion of the various nutritional components against an individual's daily requirements, the Hannaford team decided to positively signpost nutritional values, both on the front of the pack and at the point of sale with their "Guiding Stars" initiative.

By 2009, there were positive sales outcomes and happy customers. The system had also been rolled out to other U.S. supermarkets in the Delhaize Group - Sweetbay, Bloom and Food Lion. At the heart of their message is a health and wellness strategy that has supported a key business differentiator. In November 2008, *Health* magazine recognized this approach by including both Hannaford and Food Lion in their list of America's 10 healthiest grocery stores.

Mark R. Doiron
Executive Vice President, Hannaford Bros. Co.

How it works:

- Guiding Stars is an objective, consumer-driven program that is not influenced by price, brand or manufacturer trade groups.
- All edible products are rated - over 60,000 so far.
- It highlights foods with superior nutritional density; it does not "police" less nutritious food choices.
- The proprietary algorithm is grounded in evidence-based science and the recommendations of authoritative bodies such as the Food and Drug Administration (FDA) and WHO. This is protected by a panel of seven nutrition experts.
- The formula debits a product's score for 'trans' fat, saturated fat, cholesterol, added sodium and added sugars. It credits a product's score for vitamins, minerals, dietary fibre and whole grains.
- The resulting score represents a weighted total and only foods that score above zero receive guiding stars. One is 'good', two is 'better' and three is 'best.
- About 25% of foods receive at least one star. For example: 100% of fresh fruits & vegetables, 54% of cereals, 51% of seafood, 23% of dairy, 22% of meat, 8% of bakery, 7% of soups.
- The system goes beyond the shelf and into the store cafeteria as well.
- Sales response has been positive as products with stars have outperformed store growth by 1.38% over two full years of the system.



"There is quantitative and qualitative research that shows that consumers recognize the Guiding Stars program and are using it on a regular basis. In fact, some of our occasional customers have become more loyal customers." - Mark R. Doiron

4.3 Clinical findings on the health benefits of pulses

When it comes to pulses, the challenge for health professionals is to accurately describe the benefits of consumption. "There are not a sufficient number of studies for us to make health claims at this time, so it's really critical that we contribute the largest to build the body of research on pulses with studies that have been done with the most stringent scientific processes," said Sara Rose, Vice President and Director for Strategic Business Development for Bush Brothers, the largest producer of canned beans in the U.S. "Science can provide a rational reason to increase consumption."

Health claims rely on scientific data. Funded by the government and pulse industry in Canada, researchers at Canadian and U.S. universities undertook seven human clinical trials between 2006 and 2008 to look at the relationship between pulses and chronic disease. The studies revealed a number of positive results in relation to the prevention of diabetes, heart disease and obesity. The main findings of these seven randomized, controlled clinical studies are summarized below.

Key health benefits of pulses identified in clinical trials:

Pulses & Cardiovascular Health

- Reduce cholesterol levels
- Help restore blood flow in patients with fatty plaques in their arteries

Pulses & Weight Management

- Decrease appetite
- Decrease in body weight or body mass index
- Decrease waist circumference or abdominal obesity

Pulses & Diabetes

- Reduce the incidence of sharp increases in blood glucose levels after eating a meal
- Improves insulin resistance

Pulses & Gut Health

- Serve as prebiotic material
- Increase levels of healthy gut bacteria
- Reduce levels of putrefactive and pathogenic gut bacteria
- Eating pulses is associated with negligible incidence of flatulence and minimal disruption to overall gastrointestinal function

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Pulse consumption and the regulation of food intake, blood glucose and cholesterol levels
Lead researcher: Dr. G. Harvey Anderson, University of Toronto

The effects of whole and fractionated yellow peas on indices of cardiovascular disease, diabetes and gut health
Lead researcher: Dr. Peter Jones, Richardson Centre for Functional Foods and Nutraceuticals, University of Manitoba

Impact of pulse consumption on intestinal microbiota, serum lipids & gastrointestinal response
Lead researchers: Dr. Amanda Wright and Dr. Alison Duncan, University of Guelph

Pulse consumption, weight loss success & chronic disease risk
Lead researcher: Dr. Megan McCrory, Purdue University

Prebiotic effects of chickpeas
Lead researcher: Dr. Wendy Dahl, University of Florida

Effects of pulse incorporation into the diet on components of the metabolic syndrome, body fatness and food habits in women
Lead researcher: Dr. Sylvie Dodin, Laval University

4.4 Environmental campaigners looking for change

The WWF in the UK published their "One Planet Food Strategy" in 2009. Against an overall recommendation for inclusiveness and co-operation with stakeholders, they set out expectations on cutting greenhouse gas emissions, water usage and ecological damage associated with food production. They also declare an intention not to be sidetracked by "past and present emblematic issues and conflicts such as those around organic food and farming, food miles, genetically modified organisms and large vs. small agriculture."

As the European Commission prepared its "Sustainable Consumption and Production Action Plan" in 2007, EuroCommerce, which represents the retail, wholesale and international trade sectors in Europe, had some firm suggestions[20]:

- Environmentally-friendly products should be given a favourable treatment in trade policy.
- There should be encouragement and reward for environmentally-friendly behaviours.
- Further research on the gap between knowledge and behaviours is needed before being able to develop tools to enhance sustainable consumption.

On the relationship between climate change and livestock production, Nobel laureate RK Pachauri declared at a presentation in London in September 2008 that "a reduction in the size of the livestock industry through reduced consumption is the most effective way to cut the greenhouse gas emissions from animal production"[21]. He proposed that a change in consumption is required to create a low carbon and sustainable society.

However, there is great complexity. Policy makers must also consider the relevance and importance of livestock production to local economies and the environment. Many carbon, ecology and water footprint mitigation measures are already available and are being applied in the livestock sector. In summary, a leading NGO is calling for inclusive co-operation to cut ecological damage. Business is calling for encouragement and reward in legislation and a government policy advisor is calling for a change in consumption.

Key environmental benefits of pulses in agricultural and environmental research:

Pulses & Manufactured Nitrogen

- Nitrogen is the main nutrient used for plant growth. Manufactured nitrogen fertilizer helps feed the world but is energy intensive. Two tonnes of fossil fuel are needed to manufacture, distribute and apply one tonne of fertilizer.
- Pulses are able to fix their own nitrogen through symbiosis with soil micro-organisms. A field of pulses uses about half the fossil energy inputs of other crops (a).

Pulses & Life Cycle Assessment using ISO14000 Environmental Management Standards

- Life cycle assessment of field crops measures the use of fossil fuels for mechanization, pesticides and fertilizers. Greenhouse gas emissions and water usage are also considered.
- The measurement for peas has been shown to be 8 - 10 GJ/ha vs. 16-20 GJ/ha for wheat (b). Results for other pulse crops will be available in early 2010.

Pulses & Soil Health

- Increased microbial activity (c) leads to enhancement of bio-diversity and soil quality attributes (d).
- Diversification in crop rotations improves opportunities for less tillage which reduces weeds and pathogens and, thus, pesticide applications (b).

References:

(a) GLIP http://www.eugrainlegumes.org/

(b) Nemecek, T. and D. Baumgartner. 2006. GL-Pro Report: Environmental impacts of introducing grain legumes into European crop rotations and pig feed formulas. Agroscope Reckenholz-Tänikon Research Station ART, Zurich, Switzerland. 63 pp.

(c) Johnston, A.M., Clayton, G.W., Miller, P. 2007. Introduction to "Pulse Crop Ecology in North America: Impacts on Environment, Nitrogen Cycle, Soil Biology, Pulse Adaptation, and Human Nutrition". Agron. J. 99: 1682-1683.

(d) Campbell, C.A., Zentner, R.P., Liang, B.C., Roloff, G., Gregorich, E.C. and Blomert, B. 2000. Organic C accumulation in soil over 30 years in semiarid southwestern Saskatchewan - Effect of crop rotations and fertilizers. Can. J. Soil Sci. 80: 179-192.

5. Novel uses for pulses

There are opportunities for consumer-directed recipe innovation as studies prove the benefits of pulses in the diet. Pulses not only provide a natural ingredient, but increased usage offers manufacturers new development and marketing options.

Ten Food Industry Innovations for Pulses

1 BATTER AND BREADING COATING SYSTEMS USING PEA STARCHES AND FLOURS

Uses

Pea starch as a viable alternative to modified corn starch

The addition of pea fibre to improve batter viscosity

Whole or split yellow pea flour to replace 100% of wheat flour in pre-dust and batters

Benefits

The addition of pea starch in coatings improves batter adhesion when held in food warmers.

Gum thickening agents used in batter formulations can be removed from recipes.

Higher fibre and protein content in batter.

Positive sensory results for flavour.

2 NOODLES, PASTA AND BREAD CONTAINING PULSE STARCHES

Uses

Formulation of cooked pasta containing 30% pea starch per 240ml (1/2 cup) serving of cooked pasta

Benefits

Pasta would contain 2g resistant starch; more than double the amount without pea starch (0.9g). Resistant starch has associated health benefits such as improved insulin sensitivity and improved colon health.

3 PASTA CONTAINING CHICKPEA FLOUR

Uses

30% inclusion of chickpea flour in formulation

Benefits

Improves colour and flavour. Sensory panelists found the more intense flavour acceptable (Other pulse flours are also effective).

Chickpea flour increases the protein content and is high in the essential amino acid lysine, which is deficient in cereal grains.

The starch content is lower as compared with semolina.

4 INCREASE THE FIBRE CONTENT OF WHEAT-BASED PRODUCTS

Uses

Include pea fibre as 35% of 45-50g tortilla formulation contained approximately 8g of fibre. Pea fibre can be used in many other baking applications: breads, muffins, bagels, etc.

Benefits

This would contain about 8g of fibre, which is about twice the amount found in whole wheat tortilla, enabling health claims relevant to national legislation.

Tortillas made with pea fibre are darker than white flour tortillas but lighter than those made with whole wheat. Sensory panelists reported acceptable taste (Pea fibre flavor is mild and disappears with cooking).

5 INCREASE THE FIBRE CONTENT OF GLUTEN-FREE CRACKERS

Uses

Incorporate pulse flours and fibres into gluten-free formulations to increase fibre and protein content

Benefits

Fibre levels will be higher. Gluten-free products tend to be low in fibre as wheat bran cannot be included in the formulation.

6 REDUCE THE FAT CONTENT IN PROCESSED MEAT PRODUCTS & MAINTAIN SENSORY CHARACTERISTICS

Uses

Improve the texture of low fat sausages by including pea starch and fibre

Benefits

Gluten-free alternative to using wheat. Pea starch and fibre performed equally as well as wheat flour.

4% incorporation of pea ingredients improves water retention at the production stage and during storage.

Use of pea starch or fibre offers processors the opportunity of improved cooking yield for pre-cooked products. Sensory panelists reported improved colour without negative effects on juiciness and firmness. Flavour outcomes improved with pea fibre (but declined with pea flour).

7 INNOVATIVE PULSE-BASED SNACK FOODS, HIGH IN FIBRE AND PROTEIN

Uses

Puff pulse flours to make aerated snack foods using 100% pulse ingredients

Benefits

High fibre and protein will contribute to the health properties of the snack.

8 PULSE INGREDIENTS INCLUDED IN PROBIOTIC YOGURTS

Uses

Probiotic yogurt formulations containing pulse fractions such as pea protein, chickpea flour, lentil flour and pea fibre as a nutritive source for bacteria

Benefits

Pulse ingredients increase the acidification rate of the bacteria.

Pulses' oligosaccharides contribute to a prebiotic effect.

9 INNOVATIVE EMULSIFIERS

Uses

Pea protein as an emulsifier in salad dressings and sauces

Benefits

Pea starch improves soy protein-stabilised food emulsions, such as tofu. Sensory panelists reported acceptable flavour outcomes.

10 PEAS PROVIDE PROTEIN SOURCE IN MEAT ANALOGUES

Uses

Pea protein isolate as a protein source to generate vegetable-based meat analogues

Benefits

Pea protein has a lower allergenicity as compared with soy.

Pulses are not genetically modified.

Source: Pulse Canada

6. Solutions

A few things must be in place in order for there to be a change towards sustainable production and consumption. It's not just about soil health, innovative recipes or improved labelling. It's really about a shared commitment to improvement by people that are prepared to recognize that they can play a part.

THIS IS REALLY SIMPLE. IF MORE PULSES ARE EATEN, MORE WILL BE GROWN. THAT'S GREAT NEWS FOR HEALTH AND FOR THE ENVIRONMENT.

More pulses in diets

People should have more pulses in their diet.
There will be positive effects on heart disease, diabetes and obesity.

The health benefits of eating more pulses are clear. Of course, more fresh fruit and vegetables should be eaten, but another major contribution would be an increased intake of pulses such as beans, peas, lentils and chickpeas. These foods are rich in protein and micronutrients. Because of their low fat, high fibre and low glycemic index carbohydrate content, pulses are ideal to address problems of over-nutrition such as obesity and diabetes. They're also ideal to help solve malnutrition wherever it occurs.

> "EAT BEANS, PEAS, LENTILS AND CHICKPEAS OFTEN" SHOULD BE A FOOD-BASED DIETARY GUIDELINE IN EVERY COUNTRY OR REGION OF THE WORLD."
>
> *Professor Esté Vorster*
> *North-West University, South Africa*

More pulses as ingredients

Pulses and their products, such as flour, protein and starch, should be included in more recipes.
They will increase protein levels, transform nutritional profiles and enable credible health claims.

The focus on climate change and health, combined with innovations in cooking technology, has created options to use pulses as an ingredient. Consumers are looking for innovation in recipes from the food industry and at home. Using pulses in products such as pasta, muffins and tortillas means consumers can conveniently get the health benefits in food that they already love to eat. Starches, proteins and fibres can be used to fortify food recipes and still deliver functional properties for a high quality product.

Benefits: Sustainable production

The food business has hardly begun to tackle what will be a vital new science: understanding the carbon impact of ingredient use. Pulses demand serious consideration to be far more widely used as ingredients than they are at present.

The cultivation of pulses reduces greenhouse gases because as legumes they have a symbiotic relationship with naturally-occurring soil bacteria that create their own fertilizer from atmospheric nitrogen. Pulses release half the greenhouse gas emissions of non-legume crops[22].

Benefits: Sustainable consumption

Rich in protein and micronutrients, pulses are ideal to help improve malnutrition. At the same time, because of their low fat, high fibre and low glycemic index carbohydrate content, these nutrient-packed legumes offer protective and therapeutic effects to chronic health conditions such as obesity, cardiovascular disease and diabetes.

Human clinical trials are investigating and substantiating the role of pulses in these lifestyle diseases providing health professionals, the food industry and consumers everywhere with the evidence to promote and encourage pulses as part of a healthy diet.

7. Call to Action

Small improvements in the majority of products will bring much greater and quicker environmental and health benefits than large improvements in a limited number of products.

There are three things the food business needs:

1. A CREDIBLE MESSAGE TO CONSUMERS: WHAT HEALTH MESSAGES CAN BE MADE?
2. IDEAS FOR FORMULATIONS: HOW CAN PULSES BE USED?
3. ENVIRONMENTAL CLAIMS: WHAT IS THE ECOLOGICAL IMPACT OF PULSE PRODUCTION?

For more information, visit Pulse Canada at
www.pulsecanada.com









Annex

Generic considerations when using any pulse ingredient for value-added applications

Nutrition

- All pulses are similar in nutritional content. A typical nutritional breakdown is for white pea (navy) beans. They are used to make canned baked beans and contain, per 100g of dried beans: 21.4g protein, 1.6g fat, 45.5g carbohydrate, 25.4g fibre, 6.7mg iron and 180mg calcium.
- Pulses are rich in vegetable protein and a good source of the amino acid lysine, one of the essential building blocks of protein. Cereal grains are deficient in lysine. When eaten together, pulses and cereals provide all the essential amino acids to build complete protein in the body.
- Pulses are high in complex carbohydrates such as fibre, resistant starch and oligosaccharides.
- Pulses are high in vitamins and minerals like folate and iron. They are also rich in antioxidants.
- Pulses are low in fat, which is mostly unsaturated.
- Pulses are gluten free.

Health

- Pulses are the most important dietary predictor of survival in older people of different ethnicities[23].
- Legume consumption is highly correlated with a reduced mortality from coronary heart disease .
- Pulses have a low glycemic index. They're a valuable food for people with or at risk of diabetes[24].
- Non-digested prebiotic carbohydrates like fibre and resistant starch stimulate the growth of good bacteria in the colon.
- The high protein and complex carbohydrates in pulses provides long-lasting energy which is good for sports and endurance activities.

Allergens and intolerance

- The major eight food allergens listed by the Food and Drug Administration (FDA) account for 90% of food allergies in the U.S. Globally there is a variance to this list. Pulses have low allerginicity and are not included in this list[25].

General

- Nutritional or health benefits and associated costs or savings from using pulse ingredients will vary according to usage.
- Whole pulses are available as dry seeds, cooked and sterilized in cans or tetra packs, pre-cooked (micronised) or cooked and frozen.
- Processed pulses are available in the form of flours and fractions (starch, protein or fibre).
- Pulses are not genetically modified.

Pulse production in Canada

- Canada is the world's largest exporter of lentils and dry peas and one of the top five exporters of beans.
- Canadian pulse production is normally in the range of 4 to 4.5 million tonnes per year.
- Approximately 75% of Canadian pulse production is exported each year to 150 countries.

Continuous improvement in the field

Current trial developments to improve fixation of nitrogen:

- Increasing nitrogen fixation through improvements to crop rotations and field practices.
- Intercropping to capture synergistic effects of nitrogen fixation between legumes and other crops.
- Comparison of nitrogen fixation for each pulse species and their relationship with following crops.
- Selection of best genotypes of natural soil bacteria for soil inoculation.
- Increasing understanding of the plant to soil bacteria symbiosis and its effects.

Reducing crop inputs:

- Introduction of biological pest controls such as the fungi Metarhizium that causes disease in grasshoppers by acting as a parasite.
- Plant breeding to build resistance to fungal diseases.
- Building crop protection programs based on low impact chemistries.

Soybeans: Why they are not a pulse

- Soybeans are classified in the global commodity trade as an 'oilseed' because of their high fat content and usage. However, they are still a legume.
- Soybeans are less well suited to production in cooler climates and are classified as a 'tropical grain legume[26].
- Soybeans are usually crushed to produce two main components: oil and meal. The oil yield is about 18% and represents about half of human consumption of vegetable oils.
- Soy oil is second to palm oil in global consumption at 37 million tons / year[27].
- Soy meal is a high protein source of feed for livestock (95% is fed to animals, mainly poultry and pigs).
- The nutritional quality of the soybean is different from that of the pulses. It contains more protein and more fat. The nutritional breakdown of soy is per 100g of dried beans: 34.1g protein, 17.7g fat, 28.6g carbohydrate, 8.4mg iron and 226mg calcium. However, almost no whole soybeans are eaten.
- Soybean products, such as tofu, are not complete proteins because, like pulses, they're low or deficient in the amino acid methionine.
- In 2007, 63% of world soybean plantings were genetically modified ('GM'). 98% of world trade in soybeans and 82% of world trade in soy meal contained GM material[28].

Note: There are currently no GM pulses.

Endnotes

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4. 22 million tonnes CO_2 = 7.6m cars @ 2.88 tonnes of CO_2/year/car. In 2009, there are 12.5m cars registered in Canada. Assumption: Standard family car carbon dioxide emission rating = 150 grams/km (240g/mile) and average annual usage = 19,200 kms (12,000 miles) [source PG Economics, Global Impacts Study 2008].
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12. U.S. Census Bureau
13. http://dietandhealth.cancer.gov/history.html
14. 'In Defense of Food: An Eater's Manifesto' by Michael Pollan
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20. EuroCommerce Position paper from the Environment and Logistics Committee, September 2007
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22. http://www.grainlegumes.com/index.php/aep/environment/current_data_and_results/synthesis_of_the_environmental_impacts_2002_document B. Carrouée in a LINK working group on this item
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Canada has emerged as a world leader in the production and export of pulse crops - peas, beans, lentils and chickpeas - through the benefits of research, advanced technology, and our natural production advantage. World-class processing and handling systems meet customer needs for product quality and safety.Pulse Canada, a confederation of pulse industry associations, represents the growers and exporters of Canadian pulse crops. The priority areas are:

- Market access
- Transportation
- Environmental protection
- Market growth and innovation

Pulse Canada's members are the Alberta Pulse Growers Commission, the Saskatchewan Pulse Growers, the Manitoba Pulse Growers Association, the Ontario Bean Producers Marketing Board, the Ontario Coloured Bean Growers and the Canadian Special Crops Association (CSCA), which represents the processors and exporters of Canadian peas, beans, lentils and chickpeas.

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