

Protein Macro Market Drivers

1.1 Increasing Population

The growing world population will drive key decision-making into the foreseeable future. The global population is expected to reach 8.5 billion by 2030 and 9.7 billion by 2050¹, up 31% from the current population of 7.4 billion.²

While the population of developed nations is expected to remain relatively stable, growth will be driven largely by developing countries.³ China and India currently have the largest populations with 1.4 billion and 1.3 billion people respectively. By 2022, India's population is expected to surpass that of China. More than half of the world's population growth between 2015 and 2050, however, is expected to be in Africa, which is projected to more than double in population to 2.4 billion by 2050⁴.

The demand for food is expected to increase between 59 to 98% by 2050.

Harvard Business Review

Increasing population presents challenges for national and global food security as the demand for food is expected to increase between 59 and 98% by 2050.⁵ There will be a need to feed the global population in an affordable, healthy and environmentally sustainable way. Climate change, too, is expected to continue to negatively impact the ability to produce enough food to feed a growing global population.

The ability to grow and access nutritious and sustainable food will be critical to ensure the health of future populations.⁶ Crops providing 'clean' nutrients such as proteins – 'free-from' rising pollutants in the climate – will be required to stave off chronic illnesses regardless of the level of affluence.

¹ United Nations Department of Economic and Social Affairs (2015) World Population Prospects: The 2015 Revision.

² United States Census Bureau. U.S. and World Population Clock.

³ The World Population Prospects: the 2012 Revision. The United Nations, Department of Economic and Social Affairs. 2013.

⁴ United Nations Department of Economic and Social Affairs (2015) World Population Prospects: The 2015 Revision.

⁵ Elferink, M. Schierhorn, F. (2016) Global Demand for Food Is Rising. Can We Meet It? Harvard Business Review.

⁶ Carrington, D. (2014) Climate change making food crops less nutritious, research finds. The Guardian.

1.2 Increased Middle Class and Affluence

Approximately three billion people worldwide were considered to be within the middle-class in 2015, with almost half that number in Asia.⁷ The United States previously led the world in the size of its middle class, but has now been surpassed by China with 109 million people in this category. Note that while China now accounts for 20% of the world population, it holds nearly 10% of global wealth.⁸

While the wealthy class is growing at a higher rate in emerging nations, growth of the middle class will continue to increase. By 2020, the majority of the global population will be part of the middle class.⁹ Rapid growth in China, India, Indonesia, Vietnam, Thailand and Malaysia will result in Asia representing 66% of the global middle class and capturing 59% of all global middle-class consumption, including food, by 2030.¹⁰ Other regions expecting increased affluence include Eastern Europe and Latin America.

The impact of growing affluence, particularly in developing nations, is resulting in a shift in food consumption patterns to a more western-style diet characterized by high calories, animal-based protein and other resource, intensive foods.¹¹ Increased pressure, therefore, will be placed on policy makers for the development of sustainable food systems that make more efficient use of resources such as land, water, and other inputs. Food supply chains will need to transition linking production regions to consumers with safe, nutritious and affordable food.¹²

Currently less than half of the total plant protein produced worldwide is directed to human consumption.

Forum for the Future

A recent study conducted for the Forum for the Future concluded that consumer consumption of protein – animal, plant and alternative proteins – will require rebalancing to address human health, greenhouse gas emissions, water use and pollution, land use change and habitat loss resulting from increased production to feed the global population.¹³

1.3 Millennials

The millennial generation includes people born between 1981 and 1997. This group accounts for 27% of the global population or approximately 2 billion people.¹⁴ Canadian millennials now number about 9.5 million, representing 27% of the population, equal to the size of the ‘Boomer’ Generation.¹⁵ In the U.S., however, millennials represent the largest demographic at 92 million.¹⁶ Approximately 58% of global

⁷ Kharas, H. (2017) The Unprecedented Expansion of the Global Middle Class. Brookings Institute. Working Paper 100. February 2017.

⁸ Davies, J.; Lluber, R.; Shorrocks, A. (2015) Global Wealth Report. Credit Suisse.

⁹ Kharas, H. (2017) The Unprecedented Expansion of the Global Middle Class. Brookings. Working Paper 100. February 2017.

¹⁰ Pezzini, M (2012) An emerging middle class. OECD Observer.

¹¹ Ranganathan, J.; Vennard, D.; Waite, R.; et al. (2016) Shifting Diets for a Sustainable Food Future. World Resources Institute.

¹² FAO, United Nations (2017) The future of food and agriculture: Trends and Challenges.

¹³ Forum for the Future (2016) The Future of Protein.

¹⁴ Sillman, A., McCaffrey, C.R.; Peterson, E. (2016) Where are the Global Millennials? A.T. Kearney.

¹⁵ Norris, D. (2016) Millennials: The Newest, Biggest and Most Diverse Target Market. Environics Analytistics.

¹⁶ Murray, V. (2017) Translating Consumer Trends into Tomorrow’s Packaging. Brand Packaging.

millennials live in Asia and India, and number approximately 415 million and 440 million, millennials respectively.¹⁷ India, China, the United States, Indonesia and Brazil have the highest populations of millennials.

The importance of understanding this cohort cannot be understated. millennials are becoming the world's most important generational cohort for growth in consumer goods.¹⁸ In Asia, Millennials live with their parents longer and hence have more spending power than in other regions, where cultural norms see young adults moving from the family home at earlier ages.¹⁹

Millennials are engaged consumers, seizing opportunities through digital platforms (internet, mobile technology and social media). They represent the first generation that have grown up with these new technologies.²⁰

Millennials lead busy lifestyles and are concerned with food provenance and clean eating. They seek transparency, with over 80% wanting to know how their food is produced.²¹ They are more culturally diverse and more likely than other generational segments to favour vegetarian or vegan foods.²² They also place more emphasis on health and quality of food ingredients. While convenience is important, millennials look for food products produced in a socially and environmentally responsible manner.

The adventurous nature of Millennials also means that they are open to new products, ingredients and innovation.²³ However, many face budgetary restrictions, are burdened by debt and do not enjoy the same income levels that their parents did at that age.^{24,25} They are therefore price-sensitive and possess little brand loyalty.

¹⁷ Asia Today (2016) Asian Millennials: The New Big Spenders in Global Consumer Market. The World Post.

¹⁸ Sillman, A., McCaffrey, C.R.; Peterson, E. (2016) Where are the Global Millennials? A.T. Kearney.

¹⁹ Asia Today (2016) Asian Millennials: The New Big Spenders in Global Consumer Market. The World Post.

²⁰ Pew Research Center (2014) Millennials in Adulthood.

²¹ Nielsen Insights (2016) The Keys to Unlocking the Millennial Mindset.

²² Sloan, A.E. (2016) Top 10 Functional Food Trends. Food Technology.

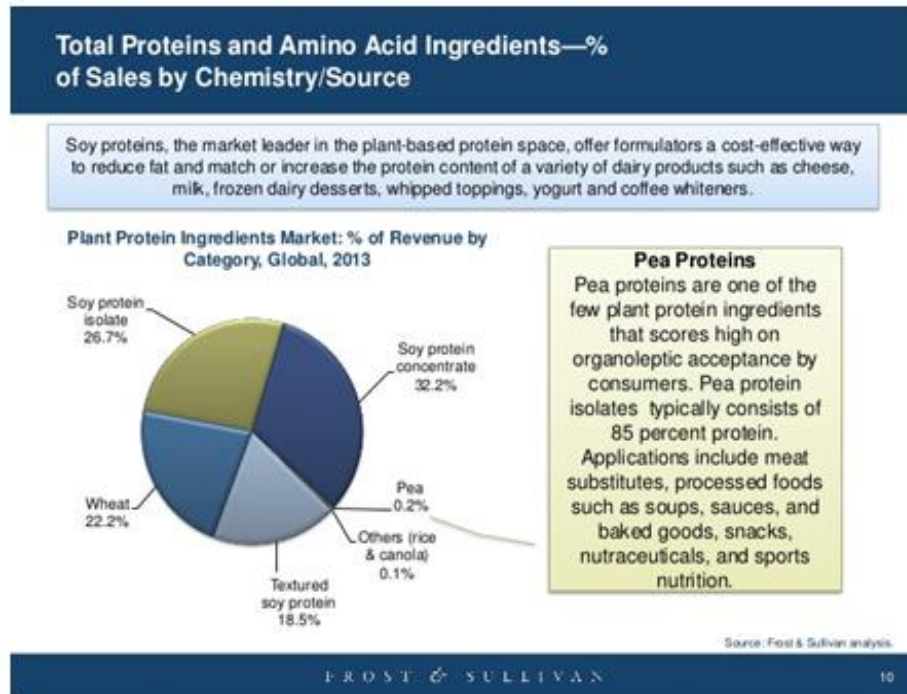
²³ Nielsen Insights (2016) The Keys to Unlocking the Millennial Mindset.

²⁴ Norris, D. (2016) Millennials: The Newest, Biggest and Most Diverse Target Market. Environics Analytistics.

²⁵ Pew Research Center (2014) Millennials in Adulthood.

2.0 Market Trends

The plant based protein market is dominated by soy protein concentrates, isolates and textured products. Wheat protein comes in at a distant second as noted in the following graphic.



The following sections describe the rationale as to why the trends toward the development and use of plant based proteins for human and animal food are growing and will continue to do so for the foreseeable future.

2.1 Plant-Based Foods

Consumers striving for a healthier lifestyle are driving the growth of plant-based products. Food and beverage manufacturers are seeking plant-based ingredients that bring a healthy halo to formulations.²⁶ Innova Market Insights reported a 63% CAGR increase in global product launches with plant-based claims between 2011 and 2015.²⁷ Protein topped the list (64%) of nutrients or components U.S. consumers are trying to consume more often according to IFIC's 2016 Food and Health Survey. In addition, 21% of American stated that they have an improved opinion on the healthfulness of plant proteins and 69% are trying to consume more.²⁸

The total U.S. market for plant-based products was USD \$5 billion in 2016.

SPINS

²⁶ Zegler, J. 2017 Food & Drink Trends 2017. Mintel.

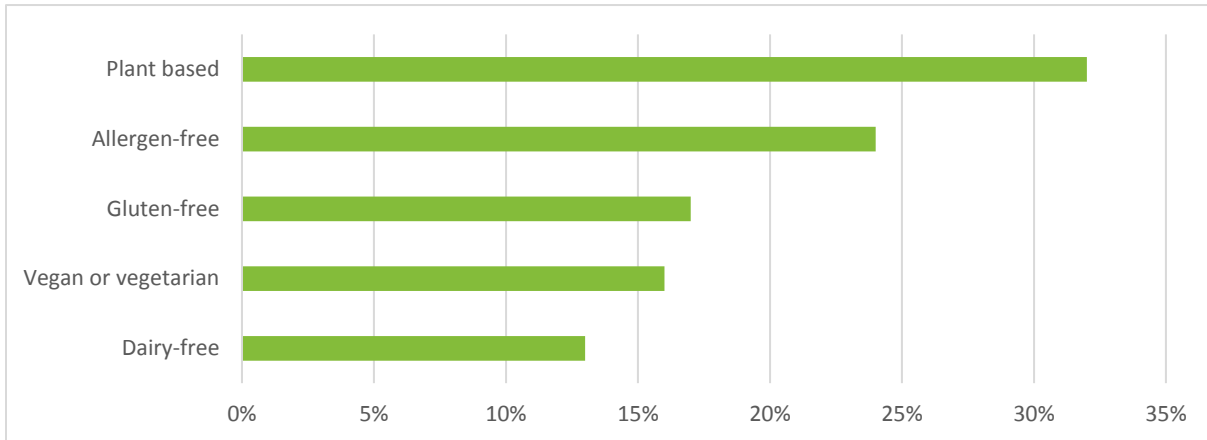
²⁷ Fitzpatrick, K. 2017 Plant-Based Proteins. Presentation March 2017 for Ag-West Bio. Saskatoon.

²⁸ International Food Information Council (2016) Food Decision 2016: Food & Health Survey.

Plant-based products rank high for Canadians. An Ipsos-Reid/AWB 2015 survey revealed that 56% of Canadian respondents are influenced to purchase products that contain protein from plant sources²⁹.

When asked about the influence of certain product attributes or claims on purchase decision, 32% rated 'plant-based' as the highest influencer, as seen below.

Role of Product Attributes/Claims in Canadians' Food Purchase Decision³⁰



Global food and beverage products featuring plant-based proteins such as soy, lentils, hemp and chia increased from 4% in 2011 to 6.5% in 2016.³¹ The global plant protein market is expected to reach \$10.2 billion by 2020, representing a 5.7% CAGR.³²

Technology is driving identification and applications of alternative proteins which are currently classified as algae, agriculture and food waste, insect, synthetic biology, and *in-vitro* meat.³³

Soy currently dominates the alternative protein market, and is expected to capture more than 80% of that market by 2024. Beyond that time, other plant-based sources are expected to gain strength in the market.³⁴ Products containing pulses are already gaining traction. Innova Market Insights reported a 74% increase in new product launches containing pulse ingredients from 2010-2014.³⁵

Pulses, hemp and oats are common plant proteins used in dairy alternatives. The global market for dairy alternative drinks is expected to reach US\$16.3bn in 2018, up from US\$7.4 billion in 2010.

Growth of alternative protein sources is poised to accelerate, potentially claiming up to a third of the protein market by 2054.

Lux Research

²⁹ International Food Information Council (2016) Food Decision 2016: Food & Health Survey.

³⁰ Ipsos Reid (2015) Healthy Foods & Ingredients: Surveying the Canadian Consumer. Conducted for Ag-West Bio.

³¹ Harfman, B. 2017 Plant-based proteins power up beverages. Dairy Foods.

³² Mintel Market Intelligence.

³³ Jacques, C. 2017 Shift to Alternative Proteins: Novel Formulations Address Hurdles to Adoptions. Lux Research. Report prepared for Agricultural Utilization Research Institute.

³⁴ Jacques, C. 2017 Ibid.

³⁵ Hughes, M. (2017) Powerful Pulses. Prepared Foods. March 2017.

China is enjoying particularly strong growth for dairy alternative drinks, with a CAGR of 18.7% forecast between 2010 and 2018, reaching a market value of US\$6.7 billion, compared with a more modest, if still impressive, CAGR of 10% in the US.

Dairy alternative drinks accounted for 7% of global dairy launches recorded by Innova Market Insights in 2016, up from 6% in 2015³⁶. Actual global launch numbers more than doubled over a five-year period. Just over half of these launches were positioned as lactose-free, nearly 40% as vegan and just under a quarter as GMO-free.

According to Innova Market Insights, dairy alternative launches grew at a CAGR of 20% over the 2012-2016 period. Meat substitutes had a CAGR of 14% over this period, while the use of a vegan positioning in global food and beverage launches tripled from 2012 to 2016³⁷.

Soy (primarily) and pea protein are expected to dominate plant-based proteins for the foreseeable future but rice, ancient grain and potato protein are expected to increase as well. The demand for and acceptance of plant-based alternatives is no longer considered a trend but has become part of the 'mainstream'.³⁴

As an example, PepsiCo is seeking "*new and novel protein sources for snacks and beverages*," as posted on NineSigma's open innovation site which shows that the world's largest food manufacturers are increasingly looking for innovative consumer ingredients. The request specifies non-GMO, clean-label ingredients with "*easy to pronounce*" or "*label-friendly*" names and a "*good sustainability story*." PepsiCo further notes that it "*wishes to avoid usage of dairy, egg, meat and gelatin sourced protein*"³⁸.

Pea protein enjoys a 50% yearly growth rate, five times more than soy protein and chickpea flour, a 155% yearly growth rate.

Kroger, 2015

2.2 Flexitarian

The flexitarian trend addresses the movement to reduce the consumption of animal derived products due to in part concerns over the environment and sustainability, as well as human health.³⁹ Innova Market Insights identified a 60% increase between 2011 and 2015 in global food and beverage launches using a vegetarian claim.⁴⁰ Product launches in the U.S. using a vegan claim increased 17% in 2016 and 5% in Canada.⁴¹

16% of Canadians are influenced to buy a food product by a vegetarian or vegan claim.

Ipsos Reid/Ag-West Bio 2015 Healthy Foods & Ingredients Survey

The meat substitute market is projected to reach global sales of \$5.2 billion by 2020 and grow by 8.4% during 2015 and 2020. The market was valued at \$3.75, billion in 2015. Sales of meat substitutes in

³⁶ Innova Market Insights. June 2017.

³⁷ Innova Market Insights. June 2017.

³⁸ https://ninesights.ninesigma.com/web/pepsico-gallery/needs-listing/-/needs-portlet/viewNeed?_NeedsPortlet_WAR_NeedPortletsportlet_needId=778

³⁹ Technomic 2017. Center of the Plate: Seafood & Vegetarian Consumer Trend Report.

⁴⁰ Shelke, K. 2016. Prepared Foods.

⁴¹ Mintel 2017. Germany Hosted the Highest Number of Vegan Launches Worldwide in 2016. March 24, 2017.

Europe accounted for 39% of the total market share in 2014. Meat substitutes prepared from organic and plant, based sources will grow at the fastest CAGR of 10.1%⁴².

As this trend strengthens, consumers will seek alternative protein options to meat, poultry and dairy. For the food industry, new plant-protein ingredients are of interest. Soy remains the top choice of protein in 71% of U.S. meat alternatives, followed by wheat protein (34%), pea protein (18%) and milk protein (3%).⁴³

Companies that provide plant-based substitutes to animal-based ingredients are currently witnessing the highest level of venture capital funding in the food and beverage sector⁴⁴.

Plant-based proteins and ‘better for you’ drinks are the two areas leading the activity. Cb Insights anticipates that these categories will only grow in popularity as innovation results in more functional ingredients and as the market demand grows.

2.3 Feed Protein

Annually, Canada produces 20 million tonnes of commercial animal feed and an estimated 10 million tonnes for on-farm use⁴⁵. The commercial feed industry generates a total revenue of \$4 billion annually. While barley, corn and wheat comprise the major inputs to feed, the primary protein sources are soybean and canola.

The Food and Agriculture Organization (FAO) estimates that the production of animal protein will increase 1.7% per annum between 2010 and 2050⁴⁶, as indicated in the following table.

FAO Outlook of Animal Protein 2010-2050 (Millions metric tonnes)

<i>Protein Type</i>	<i>2010</i>	<i>2050</i>	<i>% Change</i>
Bovine	66.7	107.5	62%
Poultry	98.9	201.9	104%
Pigs	109.3	150.3	38%
Aqua	59.9	113.7	90%
Milk	722.9	1119.7	55%
Total	1057.7	1693.1	60%

⁴² <https://www.alliedmarketresearch.com/press-release/global-meat-substitute-market.html>

⁴³ Mintel 2015. Meat Alternatives Benefit From WHO Push to Reduce Meat Consumption.

⁴⁴ <https://www.cbinsights.com/blog/food-beverage-startups-most-well-funded-vc-backed/>

⁴⁵ Animal Nutrition Association of Canada. <http://www.anacan.org.vsd46.korax.net/en/resources-links/canadian-feed-industry/canadian-feed-stats>

⁴⁶ FAO Global Food Outlook November 2012/FAO World Agriculture Towards 2030/2050 – 2012 Rev/OECD FAO Ag Outlook 2013. International Feed Industry Federation.

The demand for feed is expected to increase significantly to produce the level of animal protein projected for future consumption. Key drivers of growth are global population and increasing affluence, particularly in developing nations.

Annual global feed production in 2015 approached 1 billion tonnes with the global commercial feed manufacturing industry valued at over US \$400 billion.⁴⁷ The four countries/regions that produce over 60% of commercial feed are China (19%), the U.S. (17%), Europe (16%), and Brazil (7%).⁴⁸

2.4 Livestock and Poultry

In 2014, poultry represented the largest market for commercial feed globally as a percentage by species (45%), followed by pigs (26%) and ruminants (20%).

Globally, the livestock industry is the largest user of land resources. Approximately 3.4 billion hectares are utilized for grazing and one-third of global arable land is required to grow feed crops, accounting for more than 40% of world cereal production. Competition is increasing for the supply of protein-rich animal feeds.⁴⁹

Plant-based protein as the primary source of feed has and will continue to increase. A key challenge is how crop production will continue to keep pace with rising demand for feed.⁵⁰

2.5 Aqua Feed

The global market for aqua feed was over 41.7 million metric tonnes in 2015 (approximately 4% of the global commercial feed market) and is forecast to grow at more than 11% CAGR to 2023. Asia represents the largest market for aqua feed and was valued at US \$49 billion in 2015, with China experiencing the largest sector growth. Other countries in South East Asia (Vietnam, Thailand and Malaysia) are also fostering expansion in aquaculture to fill global demand. Denmark and Norway are driving aquaculture expansion in Europe.⁵¹

Fishmeal and fish oil are the primary ingredients of aqua feed currently. Corn, soybean and wheat are other sources used.⁵²

The supply of fishmeal in aqua feed is expected to decline by 11% by 2022 creating opportunities for alternative protein sources.

Horizon Proteins

⁴⁷ Source: International Feed Industry Federation.

⁴⁸ Source: International Feed Industry Federation

⁴⁹ IAASTD (2009) Agriculture at a Crossroads: Global Report.

⁵⁰ RaboResearch (2015) The Global Quest for Protein.

⁵¹ Transparency Market Research (2016) Aqua Feed Market – Global Industry Analysis, Size, Share, Growth, Trends and Forecast, 2019.

⁵² Horizon Proteins (2015) The Growing Global Population.

2.6 Companion Animal Food

Pet food represents only 2% of global feed tonnage.⁵³ Worldwide the market for pet food reached US \$70 billion in 2015⁵⁴ and is expected to reach US \$91 billion by 2022.⁵⁵ Over 60% of American households have at least one pet which represents 34% of the global market share.⁵⁶

Other strong world markets for pet food in 2015 were Europe (US \$20 billion), Japan (US \$6 billion), Brazil (US \$5 billion), Australia (US \$2 billion), and China (US \$1.3 billion).⁵⁷

The U.S. is the largest manufacturer of pet food, producing 8.45 million tonnes in 2015. Brazil and France manufactured 2.43 million tonnes and 1.25 million tonnes, respectively.⁵⁸

The global market for pet food ingredients was valued at US \$28.6 billion in 2014 and is projected to reach US \$37.3 billion by 2020 (CAGR of 4.5% between 2015 and 2020).⁵⁹

Plant derivatives for pet foods are projected to grow at 4.8% CAGR to 2020 from 2015 levels. The key global market is dog food, where plant derivatives were valued at US \$10 billion in 2014.⁶⁰

Plant-based proteins, including soybeans, pea, beans, potatoes and corn are widely used in animal nutrition products. Dried pea, pea fibre and/or pea protein are increasingly found in pet food products since they are a non-allergenic alternative to soy.

In 2015, 20% of global pet food launches featured a 'high in' or 'source of' protein claim. New products featured non-traditional protein sources such as game meats, seafood, non-GMO options and grain-free formulations.⁶¹

The growth of the pet food market is driven by two key factors: 1) the humanization of pets occurring in developed and developing nations resulting in increased interest in proper nutrition for pets, and 2) growing global affluence particularly in the Asia-Pacific region where pet ownership is seen as a mark of social status and sensitivity.⁶²

⁵³ Phillips-Donaldson, D. (2016) Global pet food trends: sales and volume rose 4% in 2015. Petfoodindustry.com.

⁵⁴ GfK Research.

⁵⁵ Global Industry Analysts, Inc. (2016) The Global Pet Foods Market.

⁵⁶ Phillips-Donaldson, D. (2016) Global pet food trends: sales and volume rose 4% in 2015. Petfoodindustry.com.

⁵⁷ GfK Research.

⁵⁸ Phillips-Donaldson, D. (2016) Global pet food trends: sales and volume rose 4% in 2015. Petfoodindustry.com.

⁵⁹ Research and Markets (2016) Pet food ingredients market by source, form, animal and region – global trends and forecasts to 2020.

⁶⁰ Markets and Markets (2015) Pet Food Ingredients Market by Source, Form, Animal & by Region – Global Trends and Forecasts to 2020.

⁶¹ Innova Market Insights (2016) Pet Nutrition and Food: Market Sales and Opportunities. Nutritional Outlook.

⁶² Mordor Intelligence (2017) Asia-Pacific Pet Food Market – Growth, Trends and Forecasts (2017-2022).