



The State of **Plant-Based Nutrition**

*The benefits and opportunities of the
modern plant-based diet*



TABLE OF CONTENTS

3 *Global Product Development
Made Easy*

4 *What is Plant-Based Nutrition?*

5 *Nutrient Quality in
Plant-Based Diets*

8 *Better for You, Better for All*

13 *Trends in Plant-Based Nutrition*

18 *The Future is Bright for
Plant-Based Nutrition*

21 *Griffith Foods Delivers on
Plant-Based Nutrition*



Global Product Development Made Easy

Our relationship with food started out of necessity. Humans began life on Earth as hunter-gatherers in search of food for survival. As our lifestyle changed over the centuries, so did our plates, incorporating new cooking techniques, flavors, and seasonings. Yet, somewhere along the way, food became less about nourishing ourselves and more about fulfilling social norms.

Today, consumers are recommitting to their health and nutrition more than ever before. They're focusing on nutrient-rich foods that energize. In fact, **73% of consumers** say they plan to eat and drink more healthily, and 44% say they are already succeeding.

The key ingredient to their healthy food quest?

Plants.

Demand for plant-based proteins has been **steadily growing** around the world since the 1960s, and consumers are increasingly trying to incorporate them into their diets. But are plant-based proteins actually healthier? And if they are, can they deliver on taste and texture?

Consumers seem to think so. According to The Food Institute, **seventy percent** actually consider protein from plant-based sources healthier despite the fact they may require added salt, fat, or carbohydrates to provide the fibrous, juicy texture of the traditional meats they mimic.

The key to truly eating well? Diverse ingredients and food sources that comprise a varied, yet well-balanced diet. These diets are rich in multiple vitamins and minerals while staying within caloric requirements and limiting sodium, sugar, and saturated fat.

In this report, we explore the state of nutrition today to help food developers deliver on plant-based demand while juggling consumer preferences for taste and texture. Calling on insights from our very own food scientists, nutrition scientists, and industry experts, we examine what it really means to eat healthy, and what role plant-based proteins play in the future of health and nutrition.





What is Plant-Based Nutrition?

Plant-based nutrition is not a finite concept. The term only appeared recently in nutrition science literature. Definitions even vary among nutrition organizations and experts, from simply a “high intake of plant-based foods” (British Nutrition Foundation) to “100% free from animal ingredients” (Plant Based Foods Association). Different still, **61% of U.K. consumers** define plant-based diets as vegan or vegetarian.

Thus, plant-based nutrition encompasses a whole spectrum of diets where the common denominator is a focus on plants at the center of the plate.

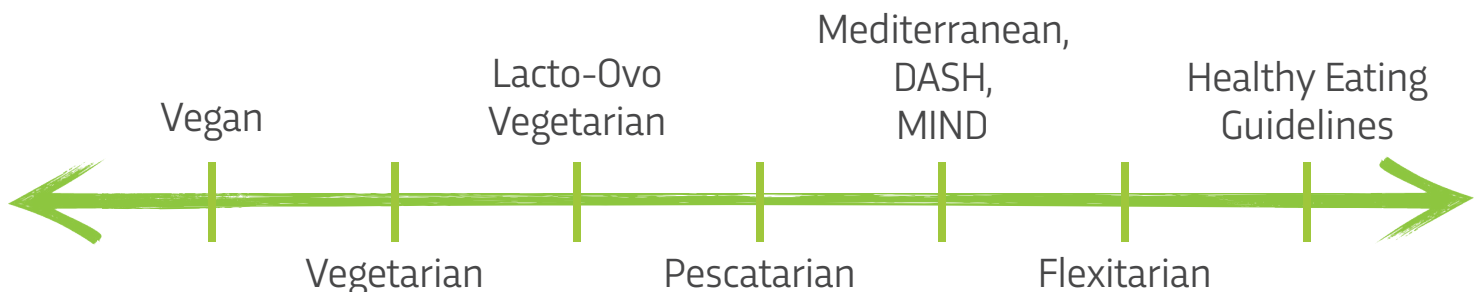
Yet, with such a broad definition, the term “plant-based” can create confusion in consumers’ minds. While neither a salad nor a candy bar contains meat (achieving some definitions of “plant-based”), each option delivers very different health and nutrition. And while some diets are plant-forward, they still incorporate traditional meat in smaller quantities.

This is why examining the context of an entire diet is more important than focusing on individual foods. Today, most public health professionals observe dietary patterns over reviewing foods in isolation. Nutrient quality and frequency matter. A bowl of ice cream every once in a while won’t impact a person’s health, but a long-term pattern of high-sugar, high-fat foods will.

“Any food can arguably be healthy or not regardless of whether it’s plant-based. Plant-based is not a guarantee.”

JACKIE SCHULZ, MS, RDN
GLOBAL NUTRITION DIRECTOR, GRIFFITH FOODS

The Spectrum of Plant-Based Diets





Nutrient Quality in Plant-Based Diets

Despite a diet’s perceived health benefits, its true value depends on the nutrients it delivers.


Humans require a certain level of macronutrients (or nutrients required in large quantities, such as protein, carbohydrates, and fat), as well as micronutrients (or nutrients required in smaller quantities, such as iron, zinc, and vitamin B12) to sustain total body health. While plant-based meat mimics are often positioned

as replacements for traditional proteins, it is important to note that the nutrient profile may differ in terms of both macro and micronutrient content.

Although different, concerns about nutrient insufficiencies for vegans and vegetarians who do not consume animal-derived foods are less significant when in the context of a diet that includes a variety of foods and nutrients.

<i>Nutrient</i>	<i>Needed For</i>	<i>Typically Found in Plants?</i>
Protein	Building and repairing muscles and bones	Yes (variable in quality)
Iron	Needed to help hemoglobin carry oxygen to blood cells	Sometimes, in leafy green vegetables (non-heme)
Omega-3	Heart health	Yes, typically seeds (ALA)
Vitamin B12	Blood and nerve cell health	No, but found in some algae
Iodine	Essential component of thyroid hormones and plays a role in immune response	No, but found in some sea vegetables
Calcium	Strong bones and teeth	Yes, especially green leafy vegetables and legumes
Vitamin D	Aids in absorption of calcium	No, but found in some UV-exposed mushrooms

Not all protein is created equal either. Protein sources in the U.S. and Canada are labeled according to the number of essential amino acids they provide along with their digestibility.



A complete protein source is one that provides all nine essential amino acids in the right proportion. Animal-based foods like meat, poultry, fish, milk, eggs, and cheese are considered complete protein sources.

An incomplete protein source is one that is low in one or more essential amino acids. Plants like rice and beans or rice and lentils are considered incomplete protein sources in isolation, but complement each other when combined to provide adequate amounts of all essential amino acids.





NUTRIENT QUALITY IN PLANT-BASED DIETS

What About Supplements?

Daily multivitamins can be a good idea for people looking to close gaps in diet and nutrients.

But supplements are likely not as beneficial as deriving a vitamin or mineral from its original plant or animal source, and they should never be a replacement for a healthy, well-balanced diet. Consumers demonstrate knowledge of this, as **only 11%** prefer to derive nutrients from supplements instead of food and drink.

Many consumers may also not know what to take, resulting in unnecessary intake and questionable benefit. Today, much of the packaged food in the U.S. is already fortified or enriched with necessary nutrients, making nutritional deficiencies uncommon. For most people, supplements may not offer significant benefits.





Better for You, Better for All

The benefits of plant-based nutrition

Modern consumers are increasingly seeking meatless food options.

A Nielsen study reported that **39% of Americans** are trying to incorporate more plant-based foods into their diets, while **35%** are making a conscious effort to simply eat less meat. While vegans and vegetarians have long understood the nutritional, economical, and environmental benefits of a plant-based diet, many consumers of traditional meat are discovering them for the first time.

BETTER FOR YOU, BETTER FOR ALL

Health

Consumers already perceive plant-based diets and proteins as healthy — but are they? They certainly can be. Vegetarians and vegans have been shown to achieve better:

- * **Weight management.** Plant-based diets are associated with lower body mass index (BMI) and greater weight loss.
- * **Cardiovascular disease risk reduction.** Plant-based diets may impact several risk factors for heart disease, including obesity, high blood pressure, blood sugar, and inflammation. Vegetarians and vegans also benefit from a reduced risk of the disease from increased fiber, reduced total and saturated fat, and lower cholesterol intake.
- * **Diabetes risk reduction.** Higher consumption of whole grains, legumes, fruits, vegetables, and nuts position vegans and vegetarians with a higher likelihood of preventing diabetes.
- * **Cancer risk reduction.** Studies suggest vegetarian diets are associated with lower overall cancer risk, especially for gastrointestinal cancers. Vegans have the greatest chance of lowering risk with higher intake of phytochemicals and fiber.



Different diets within the plant-based spectrum also boast additional health benefits.

The Mediterranean Diet

The Mediterranean diet is built on a foundation of fruit, vegetables, whole grains, and olive oil, with moderate consumption of fish and seafood and only occasional consumption of meat, eggs, and poultry. It has been shown to reduce the risks of Type 2 diabetes, several cancers, and even all other causes of death.

The DASH Diet

The Dietary Approaches to Stop Hypertension (DASH) diet emphasizes whole grains, fruits, vegetables, and fat-free or low-fat dairy while limiting meat to only lean sources (≤ 6 ounces per day), and sodium to ≤ 2300 mg per day. It is known to reduce blood pressure and improve insulin sensitivity.

The MIND Diet

The Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet combines the two previous diets, but with very specific recommendations for types of foods known to benefit cognitive health. These foods include green, leafy vegetables; berries; nuts; legumes; fish; and red wine while suggesting that butter, cheese, fried food, pastries, and sweets be minimized. The MIND diet has been shown to reduce rates of cognitive impairment from diseases like Alzheimer's and Parkinson's.

Regardless of the chosen eating plan, diet and plant-based **food quality is critical** for achieving these health benefits.



BETTER FOR YOU, BETTER FOR ALL

Price and Accessibility

Price parity is critical for broad consumer acceptance. But there's still a long way to go for plant-based food quality and taste.

If processors can crack the balance of flavor, texture, and nutrition, consumers will be more willing to pay the premium these products currently demand.

The reason alternative meat has traditionally been more expensive than animal-based competitors is due to production scale. Today, meat alternative brands are **increasing their production** by opening more factories, leading to beneficial economies of scale for leading plant-based meat manufacturers.

Plant-based sources are likely to become more affordable in the future and can even be an economical alternative to traditional meats for the underserved population. As meatless burger and chicken options become foundational to fast food menus, they increase accessibility of plant-based meat to the general population at more competitive pricing for consumers.



BETTER FOR YOU, BETTER FOR ALL

Sustainability and Global Food Consumption

Experts now predict a global population of nearly 10 billion by 2050. Feeding everyone may require as much as twice the amount of crops grown today, which is neither realistic nor sustainable.

Plant-based proteins present an important piece of the solution. As **meat and dairy products typically require more resources** to produce and create higher greenhouse gas emissions than plant-based alternatives, a global shift to a plant-based diet **could reduce mortality** and greenhouse gasses caused by food production by 10% and 70%, respectively, by 2050. In fact, **a recent study showed up to 61%** of greenhouse gas emissions could be reduced by wealthy nations turning to plant-based diets. Further, a **2019 report** concluded that “vegan and vegetarian diets were associated with the greatest reductions in greenhouse-gas emissions.”

One way product developers and food manufacturers can help is in sustainable ingredient sourcing and incorporating upcycled materials. For example, using spent grain provides multiple benefits, including cost savings, waste reduction, and increased fiber for the consumer. Other materials like green banana flour pose a way to upcycle an otherwise waste-ready ingredient for both environmental and nutritional benefit as a prebiotic for consumers.





Trends in Plant-Based Nutrition

The alternative protein industry is yet again at a turning point as new ingredients and processes emerge to accelerate innovation and revolutionize production. Whereas the focus of product developers **just five years ago** centered around matching plant-based products to traditional meat tastes and texture to appease flexitarian consumers, the industry now has its sights set on achieving comparable or greater nutrient density.



TRENDS IN PLANT-BASED NUTRITION

New Ingredients

Vegans and vegetarians are quite familiar with soy, bean, and wheat gluten sources.

Yet, while soy delivers one of the strongest nutrition profiles from an amino acid and digestibility perspective, it has a noticeable flavor and presents a problem for those with allergies. Though processors continue to use traditional alt protein bases, they're also experimenting with emerging sources, such as:



- * Algae
- * Potato
- * Pea
- * Canola
- * Hemp
- * Sacha inchi
- * Water lentil
- * Nuts and seeds
- * Cabbage
- * Jackfruit
- * Rice
- * Chickpea

These ingredients not only introduce new protein sources to the arena, but provide alternative tastes, textures, and colors to consumers.



TRENDS IN PLANT-BASED NUTRITION

More Than Patties

While the process of wet extrusion isn't new, it is becoming more commonplace among plant-based protein developers.

By using more water and incorporating fats alongside dry ingredients during processing, wet extrusion makes it easier to produce whole muscle products instead of burgers alone.

This process makes it possible to move toward more authentic meat replication besides beef and chicken patties alone. The industry is currently attempting to mimic all traditional meat formats, from whole muscle and shellfish to sausages and bacon. While the movement has strong momentum, it still has a

long way to go in terms of replicating the organoleptic characteristics consumers are used to.

At the same time, many industry leaders are forecasting that plant-based proteins will take entirely new shapes and forms beyond these conventional protein mimics. Fermentation and cultivated meat processes present a strong opportunity to launch these new formats.

“We don't necessarily need to create new. We should look at what we can improve upon and what's readily available to us on a commercial level now. Otherwise, we're going to be waiting three to five years for significant impact by developing new solutions.”

GREG MEYERS

SR. INNOVATION MANAGER, NOURISH VENTURES





TRENDS IN PLANT-BASED NUTRITION

Fortification

Fortification has long provided a viable way to solve unmet nutrient needs in the processing stage.

Processors have fortified everything from cow's milk to cereal to orange juice to burritos to improve population health with much needed micronutrients like vitamin D and folic acid. Today, fortification allows plant-based protein products to rise to the nutritional value of their traditional meat counterparts with added vitamin B12, zinc, and iron. Because vitamin B12 is only found in animal products, vegans will not receive the nutrient unless they consume foods that are fortified with it.

But can too much fortification be a bad thing? Fortification of foods is regulated, and should be based on valid information showing an existing need or gap

in a given population. Adding a nutrient doesn't always guarantee that all of it is absorbed and utilized, as in the case of iron when consumed with calcium. Solubility also plays a role in overconsumption, as megadoses of fat soluble nutrients like vitamins A, D, K, and E can stay in the body longer, **posing a risk for toxicity** if consistently overconsumed.



TRENDS IN PLANT-BASED NUTRITION

Governance

Government agencies play a significant role in the advancement of plant-based diets.

Plant-based protein availability is not equal across the world, nor are important processes like fortification required in every country.

For instance, Singapore is currently the only country with approval to sell cultivated meats, though leading companies have indicated readiness to launch in the U.S. as soon as regulatory bodies like the FDA approve. And while Canada requires fortification of foods like flour with important nutrients, governments like the

U.S. and those in Europe do not. They do, however, specify the types and amounts required if vitamins are added (e.g. enriched flour in the U.S.).

One complication is the lack of a common glossary of regulated terms. “Plant-based” is a fairly new descriptor and is not currently defined by regulation. This is why it’s critical for manufacturers to remain clear and consistent in how they define these products for consumers.





The Future is Bright for Plant-Based Nutrition

While **growth for plant-based protein products** is nearly guaranteed, food developers still have many opportunities for improving the category to meet changing consumer needs.

* 1 Focus on protein quality over quantity.

Over the past decade, consumers have increasingly looked for more ways to add protein to their diets, whether through plant- or animal-based sources. While the focus on personal health is positive, the basis for increased protein consumption may be more to keep up with consumer trends than to fill nutritional gaps. And for the average healthy adult, a variety of protein, from either plant or animal sources, provide adequate protein, along with additional nutrients.

Instead of focusing on the protein content of individual foods, consumers and manufacturers alike must look at protein quality and evaluate it alongside a holistic diet for the very best nutrition.

Methods such as the protein digestibility corrected amino acid score (PDCAAS) can help measure protein quality based on its availability to deliver essential amino acids within the right amounts. The score compares the first limiting essential amino acid in a food with the amount required, while also taking digestibility into account.

$$\text{PDCAAS (\%)} = \frac{\text{mg of amino acid in 1 g test protein}}{\text{mg of amino acid in requirement pattern}} \times \text{Protein Digestibility}$$

However, this approach is only used for labeling in the U.S. In Canada, regulators use the **Protein Efficiency Ratio (PER)**, while academics in general are proponents of the **Digestible Indispensable Amino Acid Score (DIAAS)** method.

*2 *Address differing nutrient needs.*

While plant-based protein products are still striving for general population acceptance, manufacturers have an opportunity in the coming years to serve more targeted markets of people with differing nutrient needs.

For instance, athletes and the elderly may need more than the recommended

0.8 grams of daily protein per kilogram of body weight to help maintain, repair and strengthen muscle. And those with gastrointestinal conditions may seek plant-based options that are low in short-chain fibers as part of a low FODMAP diet.

*3 *Better educate consumers to manage expectations.*

While consumer acceptance and demand for plant-based proteins has certainly grown in recent years, total mainstream adoption will depend on better understanding of what these products offer and how they're made in order to set expectations. Today, front-of-package claims tout higher protein content and added nutrients. But consumers may not be able to discern protein quality or their own need for it without proper education. Governing bodies, brands, and consumers themselves must take a more proactive stance to educate the masses in terms of what nutritional targets humans must meet, how food is made, and which products deliver on nutrient quality.

As consumers turn to plant-based alternatives, they must also be more understanding and accepting of conditions outside of manufacturers' control. Because plants depend on optimal weather and environmental resources to grow, ingredient functionality, flavor, and quality may vary across seasons. Consumers of plant-based products should be willing to accept product differences year to year, just as they've accepted shortages and other variations from the traditional meat industry.



*4 *Strive for cleaner labels.*

Consumers are increasingly seeking labels with ingredients they recognize, as well as products that offer more nutrients like vitamins, minerals, protein, and fiber. Yet, “clean label” is not currently a regulated designation. Plus, many plant-based protein products require the use of ingredients like methylcellulose that are unknown to flexitarians and new consumers, causing misunderstanding of how and why it’s used.

While a variety of factors appear to influence health perceptions of products, Nutrition Facts seem to carry the most weight. More than ingredient lists alone,

nearly one in four (23%) US consumers say the Nutrition Facts label influences their perception of healthfulness, according to a survey by the International Food Information Council. This means food developers must not solely strive for shorter ingredient lists, but healthier ingredients that produce a more well-rounded nutrition label.

*5 *Improve plant-based accessibility.*

Consumers still perceive plant-based protein products as more expensive than traditional meat, and **75%** say cost is important to them. Further, 63% say they’d eat more plant-based foods if the price was cheaper than meat-based options.

This attitude is most prevalent among lower-income groups, making it essential for processors to work toward plant-based products that are accessible to all, not just high-income countries or classes.

Quick-service restaurants (QSRs) are leading the way, bringing plant-based options to the masses at more affordable costs with chain restaurant burgers and fried “chicken.” This provides more consumers with plant-based foods at price parity and is more convenient than seeking out grocery store items to prepare themselves.





Griffith Foods Delivers on Plant-Based Nutrition

As consumers seek out more ways to improve their diets and add plant-based proteins to their plates, Griffith Foods is excited to lead the way in helping to develop more nutritious, better-for-you ingredients across the globe. Whether in promoting mindful eating or plant-based innovation, we aim to nourish the world. We strive to make plant-based food as innovative as it is delicious by:

- * Operating with a holistic, three-pronged approach that optimizes taste, texture, and nutrition.
- * Reducing nutrients of concern, including sodium, sugar, and saturated fat, at every opportunity.
- * Eliminating sensitivity-causing ingredients.
- * Ensuring the raw materials we work with are as nutrient dense as possible.
- * Offering cleaner labels with recognizable ingredients where possible.



At Griffith Foods, we remain intentional about regularly gathering global insights and partnering with early innovators in the alternative protein space to help pioneer the future of food. Our innovation team is heavily focused on alternative protein, and with branches all over the world, we continually share our research and global insights, ideas, and recipes to impact every region where people live.

In addition, **Nourish Ventures**, our support engine for a new generation of creators on the cusp of growth, exists to discover and cultivate the most pivotal plant-based and food industry innovation. Backed by over 100 years of experience, we provide promising founders with the capital, strategic resources and global access to rapidly scale and activate their impact of nourishing the world. Together, we blaze a trail toward a brighter food ecosystem that empowers human and planetary health.

This is what makes us the perfect integrator to develop highly functional and nutritive blends. With a century of industry expertise, comprehensive global insights, collaborative partnerships, and purpose-driven passion, we offer the innovation and guidance to create products that meet the needs of your consumers. Together, we can deliver the most delicious, nutritious, and sustainable food systems to nourish our growing planet.

Join us as we help pioneer the next generation of plant-based innovation.

Learn more at griffithfoods.com