

“POURING” OVER PLANT-BASED BEVERAGES

A Consumer's Guide
to Identifying the Best
Non-Milk Alternatives



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The Cornucopia Institute is chartered as a tax-exempt public charity focusing on research and education. Cornucopia aims to empower organic producers, consumers, and wholesale buyers to make discerning marketplace decisions, protecting the credibility of the organic food and farming movement and the value it delivers to society.

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INTRODUCTION

AN EVER-INCREASING ABUNDANCE of plant-based, non-dairy beverages, often labeled “milk,” are on the market these days. This beverage array now includes a number of brands with organic options.

Worldwide sales of plant-based beverages more than doubled between 2009 and 2015, reaching \$21 billion.¹ And in the first half of 2018 alone, retail sales of plant-based beverages in the United States were up 9% to \$1.6 billion.²

Consumer packaged goods companies are investing a tremendous amount in marketing to convince us that plant-based beverages are a healthier option than milk. But are they the right choice for every consumer? And how do plant-based beverages compare to one another and to cow’s milk?



In this report, you will find information about:

- What ingredients are in plant-based beverages;
- Whether some plant-based beverages are healthier than others; and
- How consumers can assess whether their individual needs are best met by plant-based beverages, cow’s milk, or a diet consisting of both.

MAJOR FINDINGS

IN AN ECHO OF THE MARKETING campaigns established decades ago for milk, including the “got milk?” and “milk does a body good” taglines³, plant-based beverages have seen a surge in marketing hype in recent years. Consumer demand, aggressive marketing campaigns, and high profitability have driven quick growth in the sector since the early 2000s. Now a seemingly endless selection of plant-based beverages occupies the beverage aisles in supermarkets.

Although marketing suggests that plant-based beverages are equivalent substitutes for dairy milk, nutrient profiles show these beverages are *fundamentally different types of food*. This report compares the nutritional value of plant-based beverages with that of cow’s milk. While cow’s milk may be the preferred choice for some consumers, non-dairy beverages may better suit individual dietary needs or lifestyle choices.

The substantive qualities are highly variable among plant-based beverages. Not only are different beverages derived from a variety of plants (e.g., nuts, grains, seeds, and legumes), each with their own characteristics, each brand also utilizes a unique formula of additives, sweeteners, and other ingredients in their finished products. Some of these ingredients are known to cause digestive problems and other adverse health issues.

Given the number of plant-based beverage formulations and brands on grocery shelves, it’s important for consumers to have the information they need to decide what choices are right for them.

Although marketing suggests that plant-based beverages are equivalent substitutes for dairy milk, nutrient profiles show these beverages are *fundamentally different types of food*.

For those who include plant-based beverages in their diets, Cornucopia’s [Plant-Based Beverage Scorecard](#) helps consumers choose brands consistent with their dietary and lifestyle objectives.*

The scorecard empowers consumers with the resources they need to avoid potentially unsavory ingredients, such as vegetable oils, sugar, and carrageenan (a potent inflammatory agent), as well as added thickeners and gums.

The best choice, whether plant-based product or cow’s milk, is always USDA certified organic.

Studies have shown that organically produced crops have fewer detectable pesticides, some of them known to mimic hormones in the body.⁴ Cumulative exposure to chemicals that mimic hormones in the body can have catastrophic effects on human health.⁵

Organic foods, including both plant-based beverages and cow’s milk, offer regulatory assurance that they’re produced without harmful chemicals. Organic certification also ensures the environmental footprint from producing food is considered. The organic seal provides more assurance for consumers than any health marketing hype or other widely available certifications on the market. It’s the only eco-label with statutory weight—the weight of law.



The organic seal is the only federally regulated label that mandates the process by which a product is grown and processed. The United States Department of Agriculture (USDA) controls the rules governing organic production. Independent certifying agencies accredited by the USDA inspect organic operations and grant use of the label, giving certified organic farms and processors access to a growing niche market. The organic seal represents an alternative to the environmental and human health problems created by the conventional industrial food system. These problems include the use of toxic agrichemicals and genetically modified organisms (GMOs), overuse of antibiotics and other drugs in livestock, and long-lasting consequences for human and environmental health.

* The information contained in this report and accompanying scorecard is not intended to substitute for professional nutrition or medical advice. We are not health care providers and advise you to seek the advice of your physician or other health care provider before implementing any dietary changes

PLANT-BASED BEVERAGES: AN OVERVIEW

PLANT-BASED BEVERAGES are manufactured by extracting plant material, seed, or grain in water. The plant materials are homogenized and, usually, thermally treated (i.e., pasteurized) to increase shelf life.⁶ Consumers can choose from a wide variety of these plant-based beverages derived from nuts, seeds, legumes, and cereal grains.

PLANT-BASED BEVERAGE SALES IN THE UNITED STATES

In 2010, one-fifth of U.S. households purchased or consumed plant-based beverages. By 2016, that number had increased substantially; more than one-third of U.S. households had purchased these products, totaling \$1.5 billion in sales that year.⁷ In 2017, non-dairy beverages posted another 9% gain over the previous year, reaching \$1.6 billion in sales.⁸

A recent market research study estimated that the global market for plant-based beverages will reach \$19.67 billion by 2023, with an annual growth rate of 12%.⁹

As plant-based beverages have grown in popularity, sales of cow's milk have declined. (See Cornucopia's [Dairy Report](#) for details on organic dairy economics).¹⁰ In the United States, sales of cow's milk fell by 22% between 2000 and 2016.¹¹ During 2015 alone, sales of milk in the U.S. suffered an estimated 7% loss, dropping to \$17.8 billion in sales.

During the same time period, organic milk sales actually increased aggressively before slowing down in 2016. Between 2010 and 2015, organic milk sales increased by more than 20% in the United States. The number of cows producing organic milk grew by more than one third between 2011 and 2016.¹²

Organic milk sales have since slowed, partly due to increasing demand for plant-based beverages.¹³



FAMILY-SCALE ORGANIC FARMERS IMPACTED BY BURGEONING PLANT-BASED BEVERAGE MARKET

The explosion of the plant-based beverage market has caused great hardship for traditional small-scale dairy and grain farmers. The majority of these beverages are conventional and made with cheap, imported soy and grain.

Fraudulent organic imports have driven organic grain and soy prices down dramatically, and authentic organic producers in the United States are struggling to remain in business.¹⁴

This is especially heart-breaking because domestic organic farmers tend to be those most devoted to organic tenets like soil stewardship and biodiversity.

Family-scale organic dairies are also suffering as plant-based beverage sales soar. Marketing to consumers pushes plant-based beverages as the “healthier” option with no discussion of the many troubling additives—or lack of nutritional substance—found in these products.

A milk allergy or sensitivity can be confused with lactose intolerance. While a milk allergy is an immune reaction to milk proteins, lactose intolerance results from an inability of an individual to digest milk sugars.

THE NEED FOR PLANT-BASED AND DAIRY-FREE FOOD

Why are plant-based “milks” growing in popularity? For many individuals, there are medical or lifestyle reasons for choosing plant-based beverages. Plant-based beverages come as a welcome alternative for those who cannot tolerate or choose not to consume cow’s milk.

A sizable minority of Americans have food allergies, sensitivities, and intolerances to foods. Plant-based alternative foods allow people whose bodies do not tolerate dairy to continue mainstream eating habits.

A Pew Research Center survey in 2016 found that “about 15% of U.S. adults say they have severe, moderate or mild allergies to at least one kind of food.” That constitutes approximately 253 million adults in the U.S. with allergies. Pew’s research also notes that “[a]nother 17% of adults have food intolerances, but no food allergies.”¹⁵

Milk is the third most common food allergy (after peanuts and tree nuts) to cause severe and even life-threatening allergic symptoms.^{16,17} In children and infants, cow’s milk is the most common food allergy.¹⁸

A true milk allergy can cause anaphylaxis, a serious life-threatening reaction. The incidence of Cow’s Milk Protein Allergy (CMPA) is between 2% and 5% for children under the age of three in developed countries. The incidence is much lower for adults.¹⁹ Allergies and sensitivities to the protein or other components in cow’s milk are the main medical reasons consumers substitute with plant-based beverages.²⁰

In the case of sensitivities, individuals may find they react to milk but not to other dairy products due to the individual qualities of each food. For example, many cheeses have lower lactose than milk. A true milk allergy differs in symptoms and treatment from both milk protein intolerance and lactose intolerance—though in all cases, removal of milk from the diet is typically recommended.²¹

A milk allergy or sensitivity can be confused with lactose intolerance. While a milk allergy is an immune reaction to milk proteins, lactose intolerance results from an in-

ability of an individual to digest milk sugars. The symptoms of allergies, sensitivities, and intolerances can vary and it is best to speak to a doctor about your concerns and to get an accurate diagnosis.

Approximately 25% of the U.S. and around 65% of the global population is lactose intolerant (i.e., lactase non-persistent).²² This means that they have some decreased ability to digest lactose due to reduced production of lactase after infancy.²³ Many individuals with lactase non-persistence retain some lactase activity, allowing them to include varying amounts of lactose in their diets without experiencing symptoms.^{24,25} In this case, they may be unable to digest milk, while cheese or other dairy products may cause fewer or no symptoms.

At the National Institute of Health (NIH) Consensus Development Conference on Lactose Intolerance and Health, lactose intolerance was defined as a syndrome of diarrhea, abdominal pain, flatulence, and/or bloating occurring after the ingestion of the milk sugar lactose. These symptoms result from a decreased ability to digest lactose due to the absence of the enzyme lactase, which breaks down lactose.²⁶

Researchers have found that it is common for people to misdiagnose themselves after consuming milk or some other dairy food and experiencing symptoms. The symptoms of lactose intolerance could be due to other conditions, such as inflammatory bowel disease, irritable bowel syndrome (IBS), colitis, celiac disease, or an unidentified food allergy or sensitivity.²⁷

Individuals who suspect they have lactose intolerance can undergo medical testing to confirm the diagnosis. The most common test for lactase deficiency is the hydrogen breath test.²⁸

Lactose intolerance, along with food allergies and sensitivities, have helped, in part, to drive the market for plant-based beverages and milk replacers.²⁹ It is likely this trend will continue as food allergies and sensitivities are on the rise. The Centers for Disease Control & Prevention reports that the prevalence of food allergy in children increased by 50% between 1997 and 2011.³⁰

In addition to plant-based beverages, lactose-free cow’s milk is available in the market and is a possible alternative for some people with problems digesting lactose.³¹

If choosing plant-based beverages for these reasons, being able to pick the best option for your specific health requirements can be a challenging task amid corporate marketing campaigns. Each individual’s dietary preferences, restrictions, and needs vary, and it’s always advisable to consult health care professionals for guidance.

THE MARKET

THOUGH DIETARY NEED is one driving factor, not all plant-based beverages are being consumed by vegans, vegetarians, or people who have dairy allergies and sensitivities. A survey conducted by Mintel in 2018 found that 90% of plant-based beverage consumers also purchase cow's milk.³² Mintel also found that one of the primary reasons consumers choose plant based beverages is was that consumers prefer the taste.³³ Because each individual in a household has specific dietary and health needs, these surveys give valuable, but limited, insight into the growth in the plant-based beverage market. What is clear, however, is that there are several factors driving the growth in the sale of non-milk products today. What are some of the reasons why these beverages are rapidly gaining in popularity?

CORPORATIONS HUNGRY FOR PLANT-BASED PROFITS

Large global food and drink companies continue to enter the plant-based beverage market. Coca-Cola is building its presence in plant-based beverages through its recent \$575 million purchase of Unilever's AdeS brand. AdeS is the second-largest global manufacturer of soy-based beverages.³⁴

Following the acquisition of AdeS, Coca-Cola European Partners launched its "AdeZ" plant-based drink line in the U.K. The almond, coconut, and oat beverages are nut and juice blends distributed in 250 ml, ready-to-drink containers.³⁵

In mid-2017, Dean Foods, the country's largest milk processor and marketer, took a majority ownership of Good Karma, a leading beverage company that markets flax-seed milk.³⁶ Dean Foods' investment in Good Karma is part of its effort to drive growth, given the company's 91% drop in net income from the third fiscal quarter in 2016 to the same period in 2017.³⁷

Dean's CEO Ralph Scozzafava said the purchase was part of the company's focus on diversification "both within and beyond dairy."³⁸



After intervention by The Cornucopia Institute and others, the Department of Justice forced Danone sell the Stonyfield Organic dairy brand due to concerns about the monopolization in the organic dairy market.

In April 2017, the French yogurt giant Groupe Danone acquired WhiteWave for \$10.4 billion, with a stated strategic focus to expand its plant-based beverage operations.³⁹ Prior to its acquisition by Danone, WhiteWave marketed Horizon Organic milk, as well as Silk and So Delicious plant-based beverages.

The new corporation, Danone-North America, continues to market these dairy and non-dairy lines.⁴⁰ However, after intervention by The Cornucopia Institute and others, the Department of Justice forced Danone sell the Stonyfield Organic dairy brand due to concerns about the monopolization in the organic dairy market.⁴¹

In addition to undertaking mergers and acquisitions, the world's largest food corporations, venture capitalists, and investment banks are infusing capital into smaller plant-based beverage companies. These large, consumer packaged food companies can capitalize on established markets by acquiring start-ups or buying companies with promising growth potential.

For example, in early 2018 the venture capital arm of General Mills invested \$17 million in Urban Remedy, a California-based brand that produces plant-based beverages.⁴²

In November 2018, PepsiCo launched its accelerator program, Nutrition Greenhouse, in the United States. Nutrition Greenhouse funds start-ups to broaden PepsiCo's range across food and beverage lines. Participants in the program receive an initial grant and one of the start-ups receives additional funding at the end of PepsiCo's six-month mentoring program.

PepsiCo first selected Remedy Organics, a plant-based beverage company, to receive funding as part of its Nutrition Greenhouse Program.⁴³ PepsiCo's launch of the Nutrition Greenhouse Program coincides closely with its launch of an oat-based beverage. Quaker Oats, a PepsiCo brand, will debut its new oat beverages nationwide in 2019.⁴⁴

In conjunction with these acquisitions, large food manufacturers have chosen to invest in expensive marketing campaigns, many of which are designed to target people born between the 1980s and the early 2000s. Their persistent advertising has proven effective, as millennials and Generation Z comprise the largest segment of consumers choosing plant-based beverages.⁴⁵ This marketing may specifically appeal to these generations based on the higher reported level of allergies and food sensitivities.⁴⁶ Younger generations are also more likely to identify as mostly vegan or vegetarian than previous generations.⁴⁷

CONSUMER IMPRESSIONS

SWEETER, TASTIER, AND HEALTHIER?

Large beverage companies are keen to capitalize on consumer motivation. A recent survey by Mintel, a market intelligence firm, showed that taste was the top reason participants chose plant-based beverages.⁴⁸ More often than not, food manufacturers add a variety of ingredients to their products to enhance flavor and "mouthfeel." Many plant-based beverages are highly processed to include added sugars, artificial and natural flavors, and additives to change color or texture.

The growing plant-based beverage industry is also poised to capitalize on consumer perceptions that their products offer certain health benefits. The Mintel survey concluded that of those consumers purchasing plant-based beverages, almost half did so because they perceived them to be more nutritious than dairy milk—not because of a documented medical condition that necessitated replacing dairy in their diets.⁴⁹

Dairy industry officials have alleged that, because many manufacturers describe their plant-based dairy alternatives as "milk," some consumers believe these non-dairy beverages have an equivalent nutritional profile to dairy milk.⁵⁰ In October 2018, Dairy Management Inc. released the results of a market study done by IPSOS, a global mar-

ket research and consulting firm. According to the study, consumers expect that products labeled "milk," whether or not they are dairy milk, share comparable nutritional characteristics.⁵¹

However, this is inaccurate. Consumers should be aware that dairy and plant-based beverages are different types of foods entirely and should be considered such when deciding what to include in their diets.

CONSUMER CONCERNS

ENVIRONMENTAL IMPACT

Consumers have also cited reduced environmental impact as a reason for seeking plant-based beverages.⁵² There has been a lot of debate over which "milks," dairy or plant-based, are better for the environment.⁵³

It is well-established that livestock contribute to environmental degradation through the destruction of native habitat and greenhouse gas emissions that lead to climate change. The livestock sector affects the natural resources that impact food security as a whole.⁵⁴ Industrial production of cow's milk is a significant contributor to concerns of localized pollution, climate change, and degradation of water resources.⁵⁵

Large-scale grain and soybean cultivation also contributes to deforestation in some areas. Around 30% of the grain grown globally is used to feed livestock.⁵⁶ Conventional soy is implicated in deforestation and destruction of habitat to a great degree.⁵⁷ Seventy percent of the soybeans grown in the U.S. and approximately 90% of the soy grown globally are used for animal feed.⁵⁸

But conscientious consumers can find environmentally friendly and sustainable operations to support if they want to drink dairy milk. Authentic organic and grass-based dairy farmers work to improve the land, practice regenerative agriculture, and support on-farm biodiversity.

There are environmental considerations for plant-based beverages as well. Some plant-based beverages rely heavily on food transportation, contributing to the production of greenhouse emissions. For example, coconuts are native to the tropics and Asia and often are shipped to distant markets for processing. Companies may transport ingredients thousands of miles.⁵⁹

However, transportation as a whole still only accounts for 11% of total greenhouse gas emissions.⁶⁰ What's more important is how the food is grown.

Some plants, such as almonds, require copious amounts of water to cultivate. Almond farmers risk depleting this critical resource in the most arid parts of California,



Nuts are highly water-intensive crops. It requires approximately one gallon of water to produce one almond, walnut, hazelnut, pistachio, or cashew.

where the majority of the world's almonds are grown.⁶¹ This use is impacting groundwater tables to the point that there are concerns drinking water supplies may be compromised. In addition, natural waterways and riparian zones that provide vital habitat to native species are often harmed by agricultural water usage. Almonds also require the transportation of already weakened bee populations across long distances to pollinate almond orchards.

Conventional almonds and other plants that become beverages rely heavily on pesticides. For example, according to the Pesticide Action Network, the USDA Pesticide Data Program has found residues of nine different pesticides on almonds.⁶² Four of these pesticides are toxic to bees, and others are known or probable carcinogens.⁶³

Ultimately, a product's environmental impact is multifactorial and depends not only on the plant or animal product itself, but the various industrial sourcing and processing methods that accompany the product.

ANIMAL WELFARE

A growing number of individuals choose plant-based alternatives due to animal welfare considerations.

Some individuals deem dairy exploitative because it requires cows to go through repeat cycles of impregnation, while removing calves from their mothers in order to harvest the milk.⁶⁴ Other animal welfare concerns include selective breeding for high milk production, inhibition of natural behaviors, and health problems associated with diets high in grains and other concentrated feed. Factory dairies illustrate the worst of these concerns.

Herd health is generally better on organic dairy farms than it is on their conventional counterparts for multiple reasons.⁶⁵ When cows eat a 100% grass-based diet, or even diets consisting primarily of forage, their health and longevity generally improve.⁶⁶

Cornucopia's [Organic Dairy Scorecard](#) highlights the certified organic dairy brands with the highest integrity, including excellent livestock care.⁶⁷ A significant factor in the scoring criteria was access to pasture and the percent of the cows' diets obtained from fresh forage. Care of the calves is also taken into account in the scoring.

There are a wide range of management practices in the dairy industry and even in the organic sector itself. It is up to consumers to determine what products meet the standards in animal welfare they are seeking.



NUTRITIONAL PROFILES OF THE MOST POPULAR PLANT-BASED BEVERAGES

ALMOND, SOY, AND COCONUT DRINKS are the most popular plant-based beverages in the United States. Almond drinks comprise 64% of market share. Soy, once dominating the category, now comprises just 13%, and coconut 12%. Retail sales of almond milk in the U.S. are projected to exceed \$1.8 billion by 2020. Coconut drinks and rice drinks are projected to show significant sales growth by 2020 as well.⁶⁸

Nutritional profiles among plant-based beverages vary considerably. Below are details regarding the nutritional content of some of the most popular plant-based beverages.

ALMOND “MILK.” Almond beverages are made with either whole almonds or almond butter and water. Manufacturers often add extra ingredients, such as carrageenan, gums, oils, lecithin, and salt. One cup of an unsweetened almond drink contains 30-35 calories, 2.5 grams of fat, 1 gram of protein, and 1-2 grams of carbohydrates.

Unsweetened versions are generally lower in calories than soy or cow’s milk. However, fewer calories also may mean fewer nutrients, including protein, which can be as low as 1 gram per 8-ounce serving of an almond beverage.⁶⁹ Almond “milk” beverages are free of cholesterol, saturated fat, casein and lactose.

Almonds are an excellent source of vitamin E, other antioxidants, and healthy fats. But because almond drinks are mostly water, they are a much less concentrated source of the beneficial nutrients found in whole almonds, including protein, fiber, and healthy fats. The almonds are often blanched with the skin removed, which also reduces the fiber, protein, vitamin, and mineral content of the finished product.⁷⁰

Commercial almond beverages usually have synthetic vitamins added to replace those lost during processing. Almond beverages are usually fortified with potassium as well as vitamins A and D.

Many brands contain only 2% almonds, consisting mostly of filtered water and additives, such as emulsifiers, sweeteners, and synthetic vitamins. Approximately 30 almonds go into making a half-gallon of almond “milk” containing 2% almonds. A carton of almond milk could sell for \$3.99 and contain only about \$0.39 worth of almonds.

Consumers should seek brands with higher percentages of nuts in order to make the most of the health benefits of almonds.

Almond beverages also may contain starches and thickeners to improve consistency and shelf life. They may include carrageenan, a known digestive irritant.⁷¹

Almonds grown in the U.S. must be pasteurized by steam or using the fumigant Propylene Oxide (PPO).⁷² PPO is a toxic chemical and probable carcinogen according to the Environmental Protection Agency (EPA), although the EPA considers the dosage safe at the levels used. In a pro-

cessed product, such as an almond beverage, the almonds may or may not be “pasteurized” beforehand.

When choosing almond beverages, it’s important to choose certified organic. While PPO often is used to treat conventionally grown almonds, it is not allowed in processing certified organic almonds.⁷³

SOY “MILK.” Soy beverages are made with soybeans and/or soy protein isolate and often contain vegetable oils and thickeners. A recent study found calcium-fortified soy milk to be the most comparable to cow’s milk in terms of the overall macronutrients (i.e., protein, carbohydrates, and fat).⁷⁴ Soy beverages are naturally free of cholesterol and low in saturated fat.

Most soy products in the U.S. come from genetically engineered plants, so if the beverage is not organic, it could be derived from GMOs.⁷⁵ More than 90% of the soy harvested in the U.S. is genetically engineered to be tolerant to the herbicide glyphosate, marketed as Roundup by Bayer/Monsanto (see Cornucopia’s report, [Behind the Bean](#), for more detail).⁷⁶

USDA certified organic soy products are the best option because they are always non-GMO and never sprayed with glyphosate, dicamba or other herbicides and insecticides.

COCONUT “MILK.” Coconut beverages are made from water and the white flesh of brown coconuts. One cup contains 45 calories, 4 grams of fat, no protein, and almost no carbohydrates.

Coconut drinks have a high fat content and are a good source of fiber. Coconut beverages do not naturally contain protein, calcium, vitamin A or vitamin D. However, such beverages can be fortified with these nutrients. As with other plant-based milk alternatives, coconut beverages often contain added thickeners, such as carrageenan, and other additives.⁷⁷

RICE “MILK.” Rice beverages are made from milled white or brown rice and water. One cup of a rice drink contains 130-140 calories, 2-3 grams of fat, 1 gram of protein, and 27-38 grams of carbohydrates.

Although they are considered the least allergenic of the plant-based beverages—making them a good choice for people with milk, soy, or nut allergies—rice drinks rank very low in nutritional composition.

Rice beverages are not protein-rich. They are high in carbohydrates and have a high glycemic index, which means the carbohydrates are absorbed quickly in the gut and rapidly raise blood sugar levels. As with other alternative “milks,” rice drinks frequently contain additives to improve consistency and shelf stability.⁷⁸

Concerns have been raised in recent years about the levels of arsenic in rice products. Inorganic arsenic was used historically in some pesticides and fertilizers applied to cotton fields, especially in the southern U.S., and to wine grape vineyards and apple and pear orchards elsewhere. Arsenic is a known human carcinogen.⁷⁹ Although many of these chemicals are banned today, inorganic arsenic is persistent in the soil. Rice recognizes arsenic as similar to silica, a needed nutrient by rice plants, so it absorbs more arsenic than other food crops.⁸⁰

Since rice is a common dietary staple, and rice, rice sweetener, and other rice derivatives are ubiquitous ingredients, the total exposure to arsenic in a diet needs to be carefully calculated. This is especially important for children, as growing bodies are more susceptible to toxins and nutritional imbalance.

The United Kingdom Food Standards Agency recommends that children under 4.5 years of age not use rice milk as a milk substitute due to concerns about arsenic levels.⁸¹

Oat “milk.” Oat beverages usually are made from a mixture of oats and water and often contain additives, such as gums, oils, and salt. One cup contains 140-170 calories, 4.5 grams of fat, 2.5-5 grams of protein, and 19-29 grams of carbohydrates. Oat drinks are high in total fiber, which may increase feelings of fullness and lower blood sugar. They contain a similar number of calories to cow’s milk, up to double the number of carbohydrates, and about half the amount of protein and fat.

Oat beverages also appeal to consumers seeking a drink without dairy, nuts, gluten, soy, or GMOs. Conventional oats, however, commonly are sprayed with glyphosate, other herbicides, and fungicides. A number of studies have shown glyphosate contamination in oat cereals.⁸²

CASHEW “MILK.” Cashew beverages are made from a mixture of cashew nuts or cashew butter and water. Fiber, protein, vitamins, and minerals from the cashew are lost when the pulp is strained from the liquid to make the drink and must be added back through fortification. One cup of an unsweetened cashew beverage contains 25-50 calories, 2-4 grams of fat, 0-1 gram of protein, and 1-2 grams of carbohydrates. It is one of the lower-calorie, lower-carbohydrate plant-based beverages.

HEMP “MILK.” Hemp beverages are made from the shelled seeds of the hemp plant that are soaked, ground, and diluted in water. Its texture is watery, so hemp beverages often have added thickeners. One analyst concluded that one cup of a hemp drink has approximately 1.25 tablespoons of hemp seed.⁸³

One cup of unsweetened hemp milk contains 80-100 calories, 4.5-8 grams of fat, and 0-1 gram of carbohydrates.

One glass provides 2-3 grams of protein with all essential amino acids, albeit small amounts of lysine and BCAA leucine.

Hemp milk is a source of essential omega-3 and omega-6 fatty acids. It also naturally contains small amounts of calcium and phosphorus. However, this beverage typically is fortified with synthetic vitamins and minerals, including vitamin A, vitamin D2, riboflavin, and vitamin B12.

HOW DO PLANT-BASED BEVERAGES COMPARE NUTRITIONALLY TO COW’S MILK?

When comparing plant-based beverages side-by-side with cow’s milk, it becomes clear that they ultimately are different foods, despite being marketed as “milk.”

Cow’s milk is usually a minimally processed, whole food, providing fat, carbohydrates, proteins, and other important nutrients. Organic milk produced by cows that graze on pasture has enhanced nutritional qualities that are naturally superior to conventionally produced cow’s milk and plant-based beverages.

Even with nutrient enhancements, many plant-based beverages do not offer the same nutritional qualities as cow’s milk.⁸⁴ For those that can utilize it, cow’s milk provides a natural source of bioavailable calcium and micro-nutrients (i.e., riboflavin, vitamins B12 and B6, iodine, niacin, thiamin, and phosphorus), in many cases at demonstrably higher levels than in plant-based beverages.⁸⁵

For consumers without dietary restrictions, or for those who simply choose to include organic cow’s milk in their diets, the nutritional profile is well-established.

The long-term implications of replacing cow’s milk with plant-based drinks are currently unknown.

The consumption of healthy fats, like those in products derived from cattle and dairy cows grazing fresh pasture, is increasingly in demand.⁸⁶ Past research and marketing guiding eaters toward a low-fat diet has been exposed as false or overblown in recent years.

A recent study that undertook a comprehensive review of research addressing milk and dairy intake and their effect on health concluded that, for those who are able to consume dairy without ill consequence:⁸⁷

- Dairy is a protein-rich food source and helps meet nutrient requirements;
- There is no association between milk consumption and all-cause mortality;
- A high intake of milk does not increase the risk of cardiovascular disease;
- There is a positive effect of high-intake milk consumption during childhood and adolescence on bone health.

The nutritional composition of beverages made from seeds, fruits, nuts, legumes, or cereals varies considerably depending on the nutrient content of the plant-based source. Methods of processing and fortification and the addition of other ingredients, such as sugar and oil, also affect the nutritional composition of plant-based products. Unlike cow’s milk, most plant-based beverages are not naturally high in protein and other nutrients, and the nutrition inherent in the nut or cereal used to make the beverage often is stripped away during extensive processing.

As a result, protein and essential vitamins and minerals must be added. Protein often is isolated or extracted from

COMMON INGREDIENTS FOUND IN PLANT-BASED BEVERAGES

Tricalcium phosphate	Vitamin A palmitate	Soy Lecithin
Dipotassium phosphate	Ergocalciferol (D2)	Tapioca Starch
Potassium citrate---potassium salt of citric acid	Salt	Sea Salt
Calcium carbonate	D-alpha tocopherol (vitamin E)	Natural Flavors
Vitamin E acetate	Magnesium Phosphate	Natural Colors
High oleic sunflower oil	Acacia	Sugar (evaporated cane juice, cane sugar, or cane syrup)
Zinc oxide	Xanthan Gum	Coconut cream
Folic acid	Guar Gum	Monosodium Glutamate (MSG)
B-12	Locust Bean gum	Pea protein
Riboflavin (B2)	Sunflower Lecithin	Rice protein

sources, such as soy or peas, which can involve extensive processing to isolate the protein and then add it to the beverage. The long list of possible ingredients in plant-based beverages on the market shows just how much processing is needed to imitate the nutritional profile of real food and create a product that appeals to consumer expectations of appearance, taste, and mouthfeel.

Manufacturers are not required to fortify plant-based beverages but, if they do, they typically add vitamins A, D, B12, and riboflavin, as well as zinc and calcium. Other nutrients, including folic acid, thiamin, niacin, magnesium, and potassium are optional.⁸⁸ Because the nutritional profile of each plant-based beverage is dependent on the manufacturer's processes, consumers must read labels carefully to learn the vitamin and mineral content of each beverage.

Even if a plant-based beverage is fortified with nutrients, the nutrients are not always as readily absorbed by the body as those occurring naturally in food. "Bioavailability" is the amount of a substance that gets absorbed by the body. Another reason milk and plant-based beverages should be considered different foods is the difference in the bioavailability of nutrients.⁸⁹

Adding calcium, for example, to a plant-based product does not guarantee a nutritional equivalence to cow's milk, as the mineral may not be as readily absorbed by the body. Calcium is essential for healthy bones and teeth and, for some individuals, is highly bioavailable in cow's milk because of other milk constituents, such as casein, which increase intestinal absorption.⁹⁰

SUBSTITUTING PLANT-BASED BEVERAGES FOR MILK

THE NUTRITIONAL CONTENT of plant-based beverages varies widely, as does the list of added ingredients. These variations complicate the comparison of health effects of cow's milk and plant-based beverages. The long-term health effects of the combination of added ingredients contained in many of these beverages remains speculative.

THE FDA'S POSITION ON PLANT-BASED "MILK"

The U.S. Food and Drug Administration recently has taken notice of the confusion caused by plant-based beverages being referred to as "milk." Of particular concern are the adverse health effects that substituting dairy alternatives could have on the health of a growing child.

TABLE 1: DAIRY VS. PLANT-BASED BEVERAGE NUTRITION*

One serving = 1 Cup



NAME	ORGANIC VALLEY GRASSMILK	WESTSOY, ORGANIC UNSWEETENED	PACIFIC FOODS HEMP MILK, UNSWEETENED	MALK ALMOND, ORGANIC UNSWEETENED	RICE DREAM, ORGANIC, CLASSIC	NATIVE FOREST COCONUT MILK, ORGANIC UNSWEETENED
Total Fat	8g/10%	5g/8%	4.5g/6%	9g/12%	2.5g/4%	45g/66%
Saturated Fat	5g/25%	1g/5%	Not listed	.84g/4%	0	39g/192%
Total Sugar	11g	3g	Not listed	<1g	10g	0g
Protein	8g	9g	3g	4g	1g	3g
Vitamin D	0%	Not listed	10%	0%	Not listed	Not listed
Calcium	20%	0%	20%	2%	2%	0%
Iron	0%	8%	10%	0%	2%	30%
Potassium	8%	Not listed	2%	2%	Not listed	Not listed
Vitamin A	8%	0%	Not listed	Not listed	0%	0%
Ingredients	Milk	Water, organic soybeans	Water, hemp seeds, disodium phosphate, gellan gum, vanilla flavor, natural flavors, tricalcium phosphate, vitamin D2, xanthan gum	Water, organic almonds, salt	Water, organic brown rice, organic oil, salt	Filtered water, organic coconut, organic guar gum

* Consumers can learn more about ingredients shown in **orange** in Cornucopia's reports, *Raising the Bar* and *"Pouring" Over Plant-Based Beverages*. They may be problematic for some individuals.

Former FDA Commissioner Scott Gottlieb said the agency is prioritizing its effort to examine public health concerns associated with dairy alternatives. The FDA has invited stakeholder feedback as it evaluates whether the use of the term “milk” allows for the erroneous assumption that the nutritional contents of plant-based beverages are similar to those of cow’s milk “despite the fact that some of these products contain only a fraction of the protein or other nutrients found in cow’s milk.”⁹¹

Dairy industry and consumer groups have long called on the FDA to address the definitional parameters of labeling plant-based beverages as “milk.” The regulations define milk as “lacteal secretions...obtained by the complete milking of one or more healthy cows.”⁹² FDA regulations also require that new foods resembling and substituting traditional foods be called “imitation” if the new food contains less protein or essential vitamins or minerals than the original.⁹³

In June 2017, a federal judge in the eastern district of California stayed a lawsuit alleging Silk Almond Milk is falsely advertised as a nutritional equivalent to dairy milk. The judge concluded that the FDA should have an opportunity to decide whether Silk’s products should be deemed “imitation” before the court proceedings continue.⁹⁴

Dairy industry advocates who are concerned about consumer confusion related to the health benefits of plant-based alternatives have taken the issue to Congress. The “Defending Against Imitations and Replacements of Yogurt, Milk, and Cheese to Promote Regular Intake of Dairy Everyday” Act (i.e., the Dairy Pride Act) would require the FDA to enforce dairy food labeling regulations for milk, yogurt, and cheese products that do not contain milk from hooved mammals.

Jurisdictions outside of the U.S. have enforced the prohibition against using the term “milk” on plant-based products. The European Court of Justice concluded that European Union regulations prevented “milk” designations from being used on plant-based products.⁹⁵ Canada also prohibits plant-based milk alternatives being labeled as “milk.”⁹⁶

NUTRITIONAL DEFICIENCIES IN CHILDREN

Almond, cashew, coconut, and rice beverages supply only a fraction of the protein found in cow’s milk. Rice, cashew, and almond beverages contain very little fat. Some plant-based beverages are not fortified with any minerals or vitamins and many contain sugar as the second ingredient.

The FDA commissioner has taken notice of reports regarding protein and vitamin deficiencies in young children raised on plant-based “milks.” Rickets has been witnessed in children who have a vitamin D deficiency

The added sugar content of some sweetened plant-based beverages approaches that of soda pop and fruit juices, which have been linked to an increased risk of obesity and the development of type 2 diabetes.

from drinking soy-based alternatives. Kwashiorkor, a form of severe protein malnutrition, also has been observed in children who were fed rice-based beverages.⁹⁷

Since the nutrient content of plant-based beverages varies widely, as do the dietary needs of each individual, it is important for every parent to do their homework and seek medical advice to determine the best ways to ensure their children’s health. Some dietitians advise that plant-based milk should be considered for consumption only after the age of two.

NUTRITIONAL HAZARDS: ADDED SUGAR AND TOTAL SUGARS

When considering plant-based options, added sugar is a key concern. The added sugar content of some sweetened plant-based beverages approaches that of soda pop and fruit juices, which have been linked to an increased risk of obesity and the development of type 2 diabetes.⁹⁸ One recent study concluded that drinking more than two sugary or artificially sweetened soft drinks a day greatly increases the risk of diabetes.⁹⁹

Too much sugar in the blood can lead to type 2 diabetes, which, if left unmanaged, can lead to problems with the heart, kidneys, eyes, and blood vessels and cause premature death. Diabetes is currently at an all-time high in the U.S. The U.S. Centers for Disease Control and Prevention report that in 2015 an astounding 30.3 million Americans (9.4% of the population) had diabetes.¹⁰⁰

High sugar intake also is associated with increased risk of heart disease.¹⁰¹ For example, the American Heart Association found added sugars increased the risk of heart disease in children.¹⁰² They recommend that children consume ≤ 25 grams (100 calories or ≈ 6 teaspoons) of added sugars per day and that children under two years of age avoid added sugars entirely.

The natural sugar in cow’s milk does not present the same concerns as added sugars in processed beverages. This is because protein and fat slow the absorption of sugar, resulting in a lower glycemic index food. A 2011 study published in the American Journal of Clinical Nutrition found that higher dairy product intake during adolescence is associated with a lower risk of type 2 diabetes.¹⁰³

CONSUMER DECISIONS for choosing plant-based beverages over dairy milk are complex and highly personalized. Some eaters are most interested in replacing taste, while others are concerned about finding the most nutritious alternatives. For some people, animal welfare is a chief concern, while others may be looking for the plant-based beverage with the lowest carbon footprint. In the rapidly changing market, these considerations require consumers to do their own homework. Cornucopia's research is available to help.

ALWAYS ORGANIC

Whether one opts for animal- or plant-based products, choosing organic is an environmentally responsible decision. Organic operations are required by law to raise animals in living conditions that accommodate their natural, instinctive behaviors and provide access to the outdoors and fresh pasture.¹⁰⁴ Organic livestock are fed 100% organic feed and forage grown without agrichemicals or genetically modified organisms (GMOs). Animals on organic farms are not administered antibiotics or hormones.

To be certified organic, dairy cows must rely on pasture for a meaningful percentage of their diets. Most conventional dairy cows, on the other hand, are confined to giant buildings or feedlots and are never given access to pasture during lactation (most of their lives).¹⁰⁵

Access to pasture by organic cows results in a more complex nutritional profile in certified organic milk when compared to both conventional milk and plant-based beverages. Organic milk often has elevated levels of omega-3 fatty acids, antioxidants, conjugated linoleic acid (CLA), and other supportive amino acids.¹⁰⁶

Buying organic products maintains standards of better nutrition, care for the environment, and, often, economic justice for farm workers.

Unfortunately, some organic dairies have adopted industrialized, conventional practices and are raising thousands of cows in concentrated animal feeding operations (CAFOs). These operations have shirked organic rules and are profiting by passing off industrially produced milk as organic.



The cows on this industrial organic dairy operation appear to spend most of their lives in the feedlot.

Photo Credit: The Cornucopia Institute, Flyover Galleries

You can consult Cornucopia's [Organic Dairy Report and Scorecard](#) to find reputable organic brands that produce nutrient-dense milk and dairy products derived from cows that have been humanely treated.¹⁰⁷

Organic plant-based beverages are also the better choice compared to their conventional counterparts. Conventional producers use an array of harmful synthetic pesticides and fertilizers. Residues can persist in plant-based beverages. Because organic regulations prohibit the use of synthetic fertilizers and highly toxic pesticides, organic producers rely on farming techniques such as growing cover crops to fix nitrogen in the soil, smothering forage crops to control weeds, and rotating crops to break pest and disease cycles.

In addition, certified organic processed foods contain—by law—only those additives that have undergone significant review and meet criteria for “essentiality” and standards for human and environmental health. In contrast, the FDA regulates conventional food additives and processing aids without questioning their essentiality or environmental impact.¹⁰⁸ For instance, the neurotoxic solvent, hexane, is used to extract conventional culinary oils.¹⁰⁹

With all these considerations it's important that consumers ask: Are plant-based beverages a better choice for my personal health needs? And are they consistent with my diet-related impact goals?

HOW TO CHOOSE THE BEST OPTION(S) FOR YOU AND YOUR LOVED ONES

1. **BUY CERTIFIED ORGANIC PRODUCTS.** The USDA organic seal indicates that the plant-based beverage was produced with a minimum of 95% organic ingredients by weight (the remaining 5% must be comprised of ingredients not available organically and have been reviewed for safety, such as salt). The organic rules require verification that all USDA certified organic plant-based beverages are non-GMO. In addition, the organic label includes the benefits of ensuring that no toxic herbicides, insecticides, or fungicides were used in the production or storage of the ingredients. Organic cultural management should result in higher nutrient density in the crop and final food product as well. Certified organic products are the best choice for human and environmental health.
2. **SUPPORT COMPANIES** that exclusively manufacture USDA certified organic products. These companies are dedicated to the values that accompany the organic label, including protection of farm workers, consumers, and the environment from exposure to toxic pesticides and processing aids. Companies that sell only some organic products and many non-organic offerings are likely exploiting the price premium they can get for using the organic seal, rather than fully committing to support the ethos behind the organic food and farming movement.
3. **CHOOSE BEVERAGES WITH NO ADDED SWEETENERS** or those with low levels of sweeteners. Plant-based beverages may contain significant amounts of added sugar. Some have a sugar content comparable to that of sugar-sweetened soft drinks even though they are marketed as “healthy.” Organic brands may also contain added sugar, although their sugars come from certified organic, non-GMO sources. To cut back on sugar, select “original” or “plain” flavors rather than sweetened options. If you are adding the beverage to a sweetened breakfast cereal, it might be quite palatable with an unsweetened product. If you’re using it for a smoothie or other homemade food, fruit or a little honey or maple syrup can be added as well.

Consuming large amounts of sugar is unhealthy. If consumed in excess, sugar promotes cardiovascular disease and type 2 diabetes. The American Heart Association recommends limiting added sugar intake to no more than six teaspoons per day.¹¹⁰ The amount of added sugar can vary widely among plant-based beverages, some containing up to 20 grams (5 teaspoons) of sugar per cup.¹¹¹

If you choose a sweetened option, organic cane sugar, honey, and maple syrup are better than artificial



sweeteners or refined non-organic sugar. Research has shown that artificial sweeteners have a host of negative health effects, including altering the gut microbiome and impairing digestion (see Cornucopia’s Yogurt Report, [Culture Wars](#), for more details).¹¹²

High fructose corn syrup (HFCS) also should be avoided. It is made from corn starch, is sourced almost exclusively from GMO corn, and can be contaminated with mercury (see Cornucopia’s Snack Bars Report, [Raising the Bar](#), for more details).¹¹³ Additionally, HFCS is linked to weight gain, which can lead to insulin resistance, type 2 diabetes, cancer, and heart disease.¹¹⁴

4. **CHOOSE BEVERAGES WITHOUT ADDED FLAVORS** and colors. Often, flavors and colors are added to plant-based beverages to improve the taste and appearance of products that have been highly processed. Artificial flavors can consist of any number of 2,500 chemically defined flavoring substances considered safe for use by the Food and Drug Administration. Synthetic colors and flavors can pose health risks and are prohibited in organic food.

The technical difference between a “natural flavor” and an “artificial flavor” is that the former must be derived from a real food at some point. Natural flavors are still likely to have been manufactured in a laboratory.

Natural flavors in organic food are held to stricter standards than those in conventional foods. While natural flavors processed with synthetic, petroleum-based solvents, such as propane and hexane, are commonly used in conventional foods, they are prohibited in organic foods (see Cornucopia’s Snack Bars Report, [Raising the Bar](#), for details).¹¹⁵ Hexane is a volatile solvent derived from gasoline refinement and is a known neurotoxin. Additionally, natural flavors in organic foods cannot contain artificial preservatives.¹¹⁶

5. **CHOOSE BEVERAGES WITHOUT NON-ORGANIC** emulsifiers and gums. Ingredients such as guar gum, acacia, xanthan gum, or soy lecithin often are added to products to enhance palatability and give plant-based

beverages a creamier, velvety mouthfeel. Anecdotal reports suggest that some of these ingredients are inflammatory agents and have been linked to allergic reactions and digestive problems in some individuals.

Xanthan gum is a thickening agent made by fermenting a yeast with corn or another sugar source. It has been linked to digestive problems and colitis.¹¹⁷

Soy lecithin is a common ingredient in processed foods, including some soy beverages. Unless organic, lecithin is extracted from soybeans using harsh chemical solvents, such as hexane, and most likely is derived from genetically engineered soybean plants (see Cornucopia's report, [Behind the Bean](#), for details).¹¹⁸

6. **CHOOSE BEVERAGES WITHOUT CARRAGEENAN.** Carrageenan is a seaweed extract that food manufacturers add to many processed foods. It serves to create a fatty mouthfeel in products such as low-fat or non-fat dairy and plant-based beverages, frozen desserts, and coffee creamer. Carrageenan adds no nutritional value or flavor to foods or beverages. Since carrageenan is derived from seaweed, some consumers assume it is healthy. To the contrary, ingestion of carrageenan carries documented health risks.

The unique chemical structure of carrageenan triggers an immune response in the body that leads to inflammation. It is a known intestinal irritant and can cause ulcers, ulcerative colitis, and irritable bowel syndrome (see our [Carrageenan Report](#) for details).^{119 120}

In April 2018, the USDA reapproved use of carrageenan in organic foods, an unprecedented move that overrode the November 2016 vote of the National Organic Standards Board to prohibit the additive in foods bearing the USDA organic label.

Given the health impacts associated with carrageenan, many organic brands have voluntarily eliminated it from their product formulations. Consumers can use Cornucopia's Plant-Based Beverage Scorecard to find out which brands do not include carrageenan.

7. **CHOOSE BRANDS WITHOUT VEGETABLE OILS.** Many plant-based beverages include some type of oil. Soybean and canola oils are commonly used. Unless the plant-based beverage is certified organic or verified non-GMO, it could contain GMO ingredients and pesticide residues.¹²¹
8. **CHOOSE BRANDS THAT DISCLOSE** the percentage of the plant-based content and have the fewest ingredients. Many plant-based milks are mostly water, added sugars, and added synthetic vitamins. For example, almonds have been found to make up only 2% of some almond beverages, which means a carton may contain about 39 cents worth of almonds. Look for the percentage of plant-based content, and choose products with fewer ingredients (which indicates less processing).

TABLE 2: COST CONSIDERATIONS

Plant-based products, even conventional plant-based beverages, bear a premium price tag, sometimes even exceeding that of organic, grass-based dairy. The costs of plant-based beverages vary considerably and different-sized packaging can make comparisons challenging when perusing grocery store shelves. The following is a sampling of prices for conventional and organic plant-based beverages and organic dairy in 2018.*

PRODUCT	PRICE PER FLUID OUNCE	PRICE PER HALF GALLON	SOURCE
365 Almond Unsweetened, Organic	\$0.05	\$2.99	 
365 Reduced Fat Milk, Organic	\$0.05	\$3.49	 
Almond Breeze Original	\$0.06	\$3.69	 
Organic Valley Whole Milk	\$0.07	\$4.19	 
Organic Valley Fat Free Milk	\$0.07	\$4.19	 
Maple Hill Whole Milk, Organic	\$0.07	\$4.49	 
Organic Valley Lactose Free Milk	\$0.09	\$5.99	 
Organic Valley Whole Cream on Top Grassmilk	\$0.09	\$5.99	 
Organic Valley Reduced Fat Grassmilk	\$0.09	\$5.99	 
Califia Farms Almond	\$0.10	\$6.40	 
Forager Cashew, Organic	\$0.12	\$7.68	 
New Barn Almond, Organic	\$0.13	\$8.32	 
Elmhurst Almond	\$0.15	\$9.34 [†]	 
MALK	\$0.20	\$12.80	 
Urban Remedy Cashew, Organic	\$0.59	\$37.76 [†]	 
Urban Remedy Almond, Organic	\$0.59	\$37.76 [†]	 

[†]With a generous assumption of 18 almonds or cashews per cup of Urban Remedy beverage, **you are paying 26 cents per nut!**

* These prices were compiled in November 2018 for products available on Amazon Prime. They are included for illustrative purposes only and not as an endorsement of Amazon or any particular product included in the analysis.

AN OVERVIEW OF THE PLANT-BASED BEVERAGES ON THE SHELVES

HERE IS A SAMPLING of the lower- and highly rated plant-based beverage brands available in stores. To find details on specific product ratings, see Cornucopia's Plant-Based Beverage Scorecard, a companion to this report.



BLUE DIAMOND, maker of Almond Breeze, received some of the lowest ratings on Cornucopia's scorecard. The brand does not offer any organic options and most of its beverages contain numerous ingredients, including thickeners and gums.

Outside of Cornucopia's rating criteria, Blue Diamond's products have been controversial.

In January 2017, Blue Diamond settled a class action lawsuit that claimed Almond Breeze advertised itself as being "made from almonds" when nuts only made up a small portion of the ingredients. The lawsuit alleged that Almond Breeze's beverages consisted of only about 2% almonds, while the rest of the beverage was made up of water, sugar, carrageenan, and sunflower lecithin.

As part of the \$9 million settlement, the company agreed to change its advertising and packaging but admitted to no wrongdoing.

In August 2018, Blue Diamond announced a recall of its vanilla flavored almond "milk" after 150,000 half-gallons in 28 states were found to contain cow's milk. Blue Diamond's almond milk is produced in a factory that also packages cow's milk.¹²²

Since some consumers who buy almond milk do so because of sensitivities or allergies to cow's milk, the cross-contamination was of high concern to the FDA.



The **DREAM** brand from Hain Celestial Group manufactures a product line of shelf-stable, non-dairy beverages, including a line of nut blends. Hain Celestial manufactures numerous Dream beverages, some of which are certified organic and others which are not. Some of the conventional and certified organic options contain carrageenan. These differences within one product line illustrate how one brand can contain higher- and lower-rated products. Check Cornucopia's scorecard to see how individual products rate.



RIPPLE, which was launched in 2016, markets pea-based "milk" beverages. Ripple uses new technology to remove color and flavor from commercially available plant protein isolates that it incorporates into foods and beverages to boost protein. None of Ripple's five pea beverages are certified organic and its vanilla and chocolate flavored beverages are high in sugar.

In early 2017, Ripple launched a media campaign attacking both dairy and its rival almond "milk." The campaign called almond "milk" a "sham" for its low protein content.¹²³

MALK

MALK ORGANICS, founded in Texas in 2014, is a family-run business. The company's founder, Alex Vega, was diagnosed with a dairy allergy as a child. MALK's entire product line is USDA certified organic and carrageenan-free. MALK products include almond, pecan, and cashew beverages, all of them made with six ingredients or fewer. MALK products contain more than one cup of sprouted organic nuts in every 28-ounce bottle. The company's products are available in over 1,500 stores nationwide and cost approximately \$5.49 per bottle.



MOOALA was founded by CEO Jeff Richards in 2016. Richards' lactose intolerance inspired him to develop dairy alternatives. Mooala's five products are all USDA certified organic. They include two almond beverages and three banana beverages, offered in three flavors. The company's products currently are carried by more than 1,500 retailers and its distribution network continues to grow.



THREE TREES was founded in California by Jenny Eu who wanted to develop plant-based beverages without any additives. Three Trees produces two almond beverages, original and vanilla. Both are USDA certified organic and the original has only two ingredients: whole almonds and water.

Three Trees products are available in natural, specialty, and co-op food stores in California, Washington, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and the District of Columbia.

HOW TO MAKE YOUR OWN ORGANIC PLANT-BASED BEVERAGE

YOU CAN MAKE YOUR OWN ORGANIC plant-based beverage by blending raw nuts, seeds, and grains with water to control the integrity of the product, the quality of the ingredients, and the cost. Making your own organic beverage also allows you to avoid unnecessary preservatives and additives.

Organic almonds, cashews, macadamia nuts, and brazil nuts are some of the options that can be liquefied into the plant-based beverage of your choice. This recipe makes suggestions for nut-beverages and can be adapted for other plant-based materials.

BASIC PLANT-BASED BEVERAGE RECIPE

Making your own nut drink and even nut-based cheese products is surprisingly easy to do. The result tends to be healthier than most store-bought brands, as there is no need to add gums and other preservatives to your home-made milk.

The type and quality of your beverage depends largely on the nuts used. Almonds produce the mildest flavor; other



types of nuts have stronger flavor profiles. You can also experiment with blending several types of nuts or incorporating the result with coconut (canned or fresh).

TOOLS:

- Nut milk bag, butter muslin cloth, or layered cheesecloth (a tight-weave cloth that will allow you to twist and squeeze without tearing it)
- Blender (high-speed preferred)
- Glass jar or container for storage in refrigerator (it will keep longer in glass)

INGREDIENTS:

- 1 cup of raw, unsalted, organic nuts (almonds, hazelnuts, pecans, macadamia, walnuts, etc.)
- Water for soaking the nuts
- Approximately 4 cups of water for blending
- Salt to taste (optional)

INSTRUCTIONS:

- Soak your nuts in 2-3 cups of water overnight, preferably in a glass or ceramic bowl. Use enough water so they remain covered as they swell.
- After soaking, drain and discard the soaking water.
- Blend the softened nuts with about 4 cups of water until almost smooth.
- Strain the blended nut mixture using the nut milk bag, butter muslin cloth, or layered cheesecloth—the resulting liquid is your nut milk!
- Refrigerate the milk. It should keep for 3 to 4 days.

The nut paste leftover from making the nut milk has many uses. For example, you can blend it very finely (a high-speed blender is likely needed for this step) to make a nut-based cheese substitute, use it as a replacement for some or all the flour in your baking recipes, provide additional healthy fat and protein in meatloaf or stir fries, or use it as an ingredient in healthy burger patties.

APPENDIX A: PLANT-BASED BEVERAGE SCORECARD CRITERIA

RATING CRITERIA

ORGANIC

500	USDA Organic
300	Organic Ingredients
0	Not Organic

INGREDIENTS

250	Two Ingredients or Fewer (i.e. filtered water and nut or grain)
0	Multiple Ingredients

CARRAGEENAN

500	No Carrageenan
0	Carrageenan

VEGETABLE OILS

100	No Vegetable Oils
90	Organic Oils
20	Conventional Oils (non-GMO)
0	Conventional Oils

ADDED SUGARS

100	No Added Sugars or Flavors
50	Organic Syrups or Organic Honey
20	Conventional Syrup or Sugar
0	Artificial Sweetener

ADDED FLAVORS

100	No Added Flavors
50	Organic Flavors or Organic Natural Flavors
20	Natural Flavors
0	Artificial Flavors

PRESERVATIVES

100	None or Organic
20	Natural (tocopherols, malic acid, sodium ascorbate, calcium carbonate, ascorbic acid)
0	Sulfites

THICKENERS/GUMS

100	No Thickeners or Gums
50	Organic Gums
0	Conventional Gums

SCORING AND RATINGS

METHODOLOGY	SCORES	RATINGS
PRODUCT RATING		
Total Score + Points Based on Percentage of Plant-Based Beverage Line that is Certified Organic	> 410	1
	410-820	2
	820-1230	3
	1230-1640	4
	1640-2050	5
BRAND RATING	Brand Product Ratings ÷ Percentage of Certified Organic Products in Brand's Plant-Based Beverage Line	1 2 3 4 5

ENDNOTES

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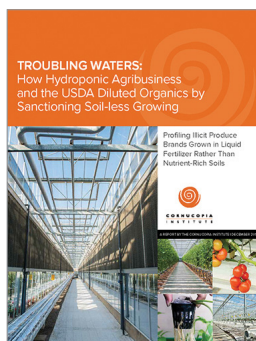
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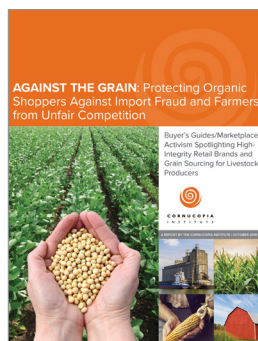
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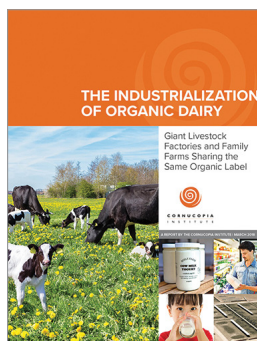
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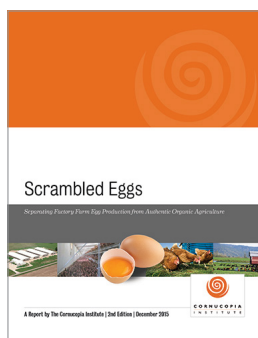
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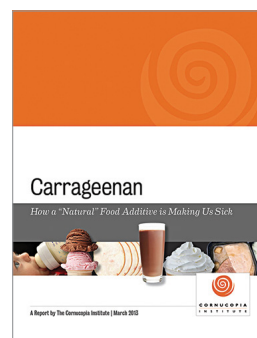
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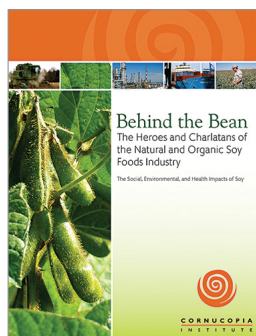
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