ABSTRACT

Consumer definitions of sustainability are largely uninformed by scientific research and may not align with industry definitions. Furthermore, consumers themselves have varied perceptions, definitions, and opinions of sustainability that vary between categories and products within the dairy category. Understanding these differences and developing marketing messaging aligned with consumer sustainability definitions offer an advantage to dairy product producers when strategically positioning their products in a changing marketplace. This review outlines the factors that may affect consumer sustainability perceptions to provide a basis for future marketing and scientific work. Consumer trends and desires for sustainability are explored, including how they are reflected in the rapid growth of plant-based alternatives. Factors that may influence consumer perception of dairy as sustainable are covered in detail, including packaging, labeling, animal welfare, organic status, grass-fed or pasture-raised feeding systems, and local and clean label perceptions. Finally, a discussion of the challenges of marketing dairy foods with sustainability messages is addressed.

Key words: sustainability, consumers, organic, grass-fed, marketing

INTRODUCTION

The concept of sustainability sprung into mainstream discussion in the 1970s, when the idea that human population growth would eventually deplete all resources available began to appear in global environmental policy (Basiago, 1995; Purvis et al., 2019). Although the term has become a political and social buzzword, its exact definition remains less clear. Alternate definitions abound, making it difficult to reach a consensus even within a specific industry such as dairy. Conflicting definitions increase the challenges of sustainability-related communication. Understanding where sustainability definitions overlap and diverge is more than a pedantic exercise: these definitions shape public opinion and policy, and failing to consider the full ramifications of a chosen definition can have widespread consequences on industry, the environment, and human quality of life. For example, a 2018 position paper from the Society for Nutrition Education and Behavior published in the Journal of Nutrition Education and Behavior cited environmental sustainability concerns when calling for replacement of animal products with plant-based foods in US dietary guidelines (Rose et al., 2019). A response to the position paper called into question the exclusive focus on environmental sustainability, instead promoting a balanced focus on 4 domains of sustainability (health, economics, society, and the environment) that included animal products (Miller et al., 2020). Miller et al. (2020) agreed on the need for sustainable food systems, but raised concerns that dietary guidance focused exclusively on greenhouse gas emissions and environmental factors as a measure of sustainability could have unintended consequences of disrupting local economies, making nutritionally adequate food unaffordable for vulnerable populations, disrupting cultural and religious drivers of dietary patterns, and encouraging increased consumption of already overconsumed plant-based food groups (e.g., grains) as a replacement for healthy animal-based products. Counter-responses from both the authors and Society for Nutrition Education and Behavior leadership integrated these additional dimensions of sustainability into their arguments, explaining that the role of nonenvironmental aspects of sustainability were initially downplayed due to the “clear and present danger presented by climate change” (Joseph et al., 2020; Rose et al., 2020). Although this exchange primarily centered around livestock production for meat, it illustrates the challenges surrounding sustainability communication for the dairy industry today. Differing definitions of sustainability are inherently in conflict, and unintended consequences may abound unless the parties involved in research and policy making carefully weigh all aspects of sustainability.

Additional complexity arises when we consider the consumer element. Consumer definitions of sustainability are largely uninformed by scientific research
and may be at a mismatch with industry definitions of sustainability. Furthermore, consumers themselves have varied perceptions, definitions, and opinions of sustainability that vary by both category and product (Bermúdez et al., 2003; Verain et al., 2016; Peano et al., 2019; Schiano et al., 2020). Understanding these differences and developing marketing messaging aligned with consumer sustainability definitions offers an advantage to dairy product producers when strategically positioning their products in a changing marketplace. To our knowledge, no previous reviews have focused on consumer perceptions and definitions of sustainability. Rather than attempt to create a comprehensive definition of sustainability that includes consumer perceptions, the objective of this review is to highlight where differences may arise between current working definitions and consumer perception. Although research on consumer perceptions of dairy sustainability is currently limited, we will compile factors that may affect these perceptions to provide a basis for future marketing research and scientific work to build upon. We will start by outlining dimensions and definitions of sustainability utilized in industry and academic definitions to provide a counterpoint to consumer definitions. Next, we will explore consumer trends and desires for sustainability, including how they are reflected in the rapid growth of plant-based dairy alternatives. We will then cover a variety of the factors that may influence consumer perception of dairy products as sustainable, including packaging, labeling, animal welfare, organic status, grass-fed or pasture-raised feeding systems, and local and clean label perceptions. Finally, a discussion of the challenges of marketing dairy foods with sustainability messages is addressed.

**DIMENSIONS OF SUSTAINABILITY**

Although a multitude of sustainability definitions are in circulation, the most common underlying conceptualization is the 3 pillars of sustainability. In this conceptualization, 3 primary dimensions of sustainability (environmental, social, and economic) are each viewed as a pillar supporting the idea of sustainability as a whole. Alternatively, the 3 dimensions are portrayed as circles overlapping in a Venn diagram, demonstrating how the elements of these dimensions can overlap (Figure 1, top). Despite widespread use, this conceptualization cannot be traced to a single source or explicit theoretical background (Purvis et al., 2019). Although the general dimensions are common, the specific elements that comprise each dimension are less agreed upon. Working definitions of sustainability, each differing slightly, have been published at every level, including in legislation. Unlike related terms such as natural and healthy, sustainability does have a legal definition for agriculture in the United States (US Code Title 7, Section 3103; US Code, 2011): “an integrated system of plant and animal production practices having a site-specific application that will over the long-term: satisfy human food and fiber needs, enhance environmental quality and the natural resource base upon which the agriculture economy depends, make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, sustain the economic viability of farm operations, and enhance the quality of life for farmers and society as a whole.” As a note, this legal definition applies specifically to agricultural practices, and not consumer products in general. However, as we will explore further in this review, this legal definition has little bearing on consumer definitions of sustainability. Of more use to this purpose is the United Nations definition, another of many that incorporate the 3-pillar model. The United Nations defines 3 strategies for sustainable development: economic (profit), social (people), and environmental (planet; United Nations Department of Economic and Social Affairs, 2015). Ecological and environmental sustainability includes preserving the environment, maintaining species diversity, and using natural resources responsibly (United Nations Department of Economic and Social Affairs, 2015). This dimension of sustainability is in line with dairy industry sustainability efforts focusing on environmental aspects such as water usage and greenhouse gas emissions (Dairy Management Inc., 2018; DFA, 2020). The social dimension of sustainability includes worker and animal health and wellbeing, whereas the economic dimension includes fair wages, affordable food prices, and supporting local economies (United Nations Department of Economic and Social Affairs, 2015). Consumer definitions of sustainability, as explored by this review, go beyond the environmental dimension of sustainability and incorporate aspects of all 3 dimensions (Figure 1, bottom).

**INDUSTRY AND ACADEMIC DEFINITIONS OF DAIRY SUSTAINABILITY**

Industry definitions of dairy sustainability tend to focus primarily on environmental and economic sustainability, although all 3 pillars of sustainability are often touched upon. Because academic work often informs industry efforts, sustainability from these perspectives will be discussed together. Attempts to define sustainable agriculture in general have focused on the multifaceted nature of sustainability, such as that defined
Figure 1. Conflicting representations of sustainability.
by Farshad and Zinck (1993) who described both over-reaching goals of sustainable agriculture (continuity of resources, dynamic land use, stable infrastructure and economy, adequate food production over time, equilibrium between natural resources and human needs) as well as specific practices that may influence sustainability (soil fertility, crop variants, economic viability, ecological soundness, human needs, philosophical ethics). This multifaceted approach is often taken by publications from industry organizations, which reference both the 3-pillar model and industry-specific key indicators of sustainable practice. For example, the Dairy Farmers of America (DFA) 2020 Social Responsibility Report defines 3 “Sustainability Pillars” (“Our Planet,” “Our People,” and “Our Communities”), whereas the 2018 US Sustainability Report from Dairy Management, Inc. instead defines 5 priorities (“Food Safety,” “Environmental Stewardship,” “Animal Care,” “Sustainable Nutrition,” and “People and Community”; Dairy Management Inc., 2018; DFA, 2020). These reports follow up with statistics on a variety of sustainability factors such as reduction in feed and water usage per cow, increase in milk production per cow, participation in voluntary sustainability auditing programs, usage of solar energy, use of nitrogen digesters, greenhouse gas emissions, crop and soil management program participation, water conservation and quality, workforce development, and community contributions (Dairy Management Inc., 2018; DFA, 2020). While industry reports give us insight into the most widely considered aspects of sustainability, numerous recent publications have attempted to quantify the sustainability effects of current or proposed dairy industry practices, including several Journal of Dairy Science invited reviews such as those by Milani et al. (2011), Martin et al. (2017), and von Keyserlingk et al. (2009). Like all animal food production systems, dairy production uses water, land, energy, and human labor (von Keyserlingk et al., 2009). From an ecological perspective, sustainability factors include water and land usage, greenhouse gas emissions, reliance on nonrenewable resources for energy, use of manure digestion to produce renewable energy, growth of crops for animal feed, fuel required for production, by-products of production, environmental nutrient management, product packaging production and disposal, and use and safe disposal of sanitizers during production (Milani et al., 2011; Martin et al., 2017; von Keyserlingk et al., 2009). Economic sustainability factors include not only the price of products and the ability of producers to remain profitable, but also factors such as the cost to the consumer of dealing with environmental pollutants, the effects of milk market globalization, and the initial investment and scale required to adopt new production technologies (von Keyserlingk et al., 2009). Factors related to the social pillar of sustainability include the proportion of jobs held by undocumented workers, animal welfare, and even public pressure and consumer political support leading to policy changes that may affect other dimensions of sustainability (von Keyserlingk et al., 2009).

**CONSUMER TRENDS AND DESIRES FOR SUSTAINABILITY**

Understanding the consumer element of sustainability is twofold. First, how do consumers perceive, understand, and define sustainability? Second, do consumers desire sustainable products and are they willing to pay for them? Understanding both these aspects provides insight into consumer decision making for sustainable dairy and helps communicate sustainability-related information in a way that will be understood and accepted by the average consumer. Consumer choice depends on the decision-making strategies used, which can be grouped roughly into high-effort and low-effort processes and strategies (Hoyer et al., 2013). During high-effort decision making, consumers methodically evaluate options and tradeoffs to reach a decision, whereas in low-effort decision making consumers instead rely on heuristics (subconscious decision-making shortcuts) and implicit attitudes (Friese et al., 2006; Hoyer et al., 2013). For the average dairy product consumer, judgments about sustainability are often low effort and made quickly at the point of purchase, with on-package messaging as the most common source of consumer sustainability information (Schiano et al., 2020, 2021). As such, it is important to investigate both implicit and explicit attitudes to gain a robust understanding of consumer perception of dairy sustainability.

**Consumer Perception, Understanding, and Definitions of Sustainability**

Unlike industry and academic definitions of dairy sustainability, consumer definitions are not well defined and highly influenced by preconceived ideas and biases. Consumers may simultaneously define sustainability in conflicting ways or desire conflicting ideals, such as valuing both technological advances and undisturbed nature in an agricultural system (Boogaard et al., 2008). Sustainability is also not a static and universal concept for consumers. Consumer perception of sustainability varies between and within product categories (Bernués et al., 2003; Verain et al., 2016; Schiano et al., 2020). In addition, segments of consumers define sustainability
differently, including within the dairy category (Verain et al., 2012; Peano et al., 2019; Schiano et al., 2021). Schiano et al. (2021) grouped US dairy consumers into 3 clusters based on their definition of sustainability as it related to dried dairy ingredients. The largest cluster defined sustainability by terms related to reducing waste and environmental harm, but a significant percentage of consumers defined sustainable by terms related to happy cows and conscious farming or by terms related to simple ingredients and minimal processing. Peano et al. (2019) segmented Italian consumers into 5 clusters based on their definition of food sustainability. The clusters were “man-nature balance” (focused on man-made environmental issues), “social welfare sensitive” (focused on sustainable economic growth, food security, and worker employment, wellbeing, and safety), “relationship with the territory” (focused on local production and personal relationships with producers), “environmental sensitive” (focused on ecology and environmental balance of ecosystems creating higher quality, and thus higher value products), and “local ecosystem preservation” (focused on local agriculture systems maintaining balance with local ecology as a method of survival for small farms). In both studies, consumer definitions of sustainability involved all 3 dimensions of sustainability (economic, social, and economic), often in overlapping ways. Along with cognitive overlap between the dimensions of sustainability, there is overlap between consumer perceptions of sustainability and related terms such as sustainable, natural, healthy, trustworthy, and ethical (Pelletier et al., 2013; Aschemann-Witzel, 2015; Verain et al., 2016; Schiano et al., 2020). Cognitive overlap can result in halo effects that profoundly affect perception and purchase intent; for example, a product marketed as sustainable may be seen by consumers as more healthy, or a product marketed as natural may be seen as more sustainable. Finally, characteristics of consumers themselves may affect perception of dairy sustainability (specific instances are discussed in detail in the Dairy Foods Factors section of this review). Consumer age has been a particular focus of sustainability-related work. Although a common misconception exists that sustainability is only the focus of younger generations, food sustainability is positively viewed by all generations (Wiernik et al., 2013; Kamenidou et al., 2020). In the case of dairy sustainability, different generations may define sustainability differently, with younger generation definitions focused more on the environmental dimension of sustainability and older generations focused more on simple ingredients and minimal processing (Schiano et al., 2020).

**Consumer Desire and Willingness to Pay for Sustainable Dairy**

Although consumer demand for sustainability is a major topic in the dairy industry, consumer purchase habits may not reflect their stated opinions. This discrepancy between stated consumer desires for sustainability and resulting consumer choices, commonly referred to as the attitude-behavior gap, is well documented in industries including fashion, transportation, energy, and food (Vermeir and Verbeke, 2006; Claudy et al., 2013; Haider et al., 2019; Park and Lin, 2020). When making tradeoffs, dairy consumers may prioritize other attributes over sustainability. Schiano et al. (2021) presented dairy consumers with 5 attributes (flavor, price, healthy, natural, and sustainable) and reported that for dried dairy ingredients, sustainability was the least important of the 5 attributes. The environment in which most dairy consumers make sustainability-related decisions (at point of sale) also may not be conducive to choosing sustainable products even if these products align with consumer values (Appleby et al., 2003; Schiano et al., 2020, 2021). Consumers at point of sale must balance conflicting priorities and can easily be influenced by the purchase habits of other shoppers (Appleby et al., 2003). Consumer willingness to pay (WTP) for sustainability has been investigated with global consumers and a multitude of product categories, including dairy, chocolate, coffee, wine, beer, almonds, bread, and seafood, although findings vary considerably depending on product category as well as consumer demographics and psychographics (Xu et al., 2012; Vecchio, 2013; Echeverría et al., 2014; Vecchio and Annunziata, 2015; de-Magistris and Gracia, 2016; Sellers-Rubio and Nicolau-Gonzalbez, 2016; Carley and Yahng, 2018). Several studies have focused on WTP for sustainable dairy as an effect of specific labeling or other product attributes (Wong et al., 2010; Wolf et al., 2011; Echeverría et al., 2014; Kühl et al., 2017; Markova-Menova and Wätzold, 2018; Canavari and Coderoni, 2020; Peira et al., 2020). These studies are discussed in greater detail in the Dairy Foods Factors section of this review.

**The Push for Plants**

An increasing desire for sustainable foods is reflected in the rapid growth of plant-based dairy alternatives, many of which market themselves as more sustainable, healthier, more natural, or more humane for animals than animal-derived foods, including dairy (Franklin-Wallis, 2019; Mintel Group Ltd., 2019; Crawford,
Regardless of whether they purchase plant-based alternatives or not, the average dairy product consumer is more likely to consider plant-based alternatives more sustainable than their dairy counterparts (Mintel Group Ltd., 2019; Schiano et al., 2020; Schiano et al., 2021). A desire for sustainability and reduced environmental impact is a key driver of plant-based milk consumption (Haas et al., 2019). Animal welfare, a concept which overlaps with the consumer concept of sustainability, is also a driving force behind choosing plant-based alternatives over dairy foods (McCarthy et al., 2017; Haas et al., 2019). Currently, more than half of dairy product consumers also purchase plant-based dairy alternatives, and consumers who purchase both on average place a higher importance on sustainability than those dairy consumers who do not purchase plant-based alternatives (Schiano et al., 2020).

**DAIRY FOODS FACTORS**

**Packaging Material and Design**

Material, design, and labeling all play a role in consumer perception of sustainability based on packaging. The average consumer has limited knowledge of packaging sustainability, relying on implicit beliefs rather than detailed analysis to make sustainability-related purchase decisions. These beliefs do not necessarily align with life-cycle assessments (LCA) of packaging sustainability, leading consumers to overestimate the importance of certain aspects (such as postconsumption waste and recyclability) while underestimating the importance of other aspects (such as the energy required to produce or transport packages; Van Dam, 1996; Nordin and Selke, 2010; Lindh et al., 2016; Steenis et al., 2017). Although the average dairy product consumer does not consider packaging sustainability in LCA, package type does affect sustainability perceptions and purchase intent. Glass packaging in particular is considered the most sustainable by fluid milk consumers, and consumers who purchase nonconventional milks are more likely to purchase milk in a glass container (Getter et al., 2014; Schiano et al., 2020). Steenis et al. (2017) found that among Dutch university students, glass jars were considered one of the most sustainable packaging options for tomato soup (second only to a biodegradable bioplastic pot), despite being the least sustainable option identified by LCA. Meanwhile, carton sachets of dry soup were considered one of the least sustainable options by these consumers despite being the most sustainable option according to LCA (Steenis et al., 2017). The low perceived sustainability of the dry carton sachets was in part due to the smaller, single use package size (Steenis et al., 2017). A similar perception of smaller packages as unsustainable was seen also for fluid milk and protein powders, although potential interactions between package size and package material were not explored (Schiano et al., 2020). More research is needed to understand how consumers perceive the sustainability of single and multiuse dairy packages produced with different materials. For fluid milk, consumers consider high-density polyethylene (HDPE) and polyethylene terephthalate (PET) plastic jugs (what conventional milk is typically sold in) to be the least sustainable milk packaging options, less sustainable than gable-top paperboard cartons (Schiano et al., 2020). Consumer perception of paper as more sustainable than plastic has been also shown in general studies of food packaging perception (Lindh et al., 2016).

Packaging design also likely contributes to sustainability perception of dairy products (Schiano et al., 2020), which is consistent with the heuristics applied by consumers when making low-effort judgments regarding food purchase. Package elements can be roughly split into 2 categories: visual (color, graphical elements, and so on) and verbal (nutrition information, claims, messaging, and so on; Rettie and Brewer, 2000). Both visual and verbal elements can influence consumer perception and purchase intent for food products including dairy. We will discuss visual package design elements in this section, whereas verbal elements including labeling will be discussed in depth in the next section. Color in particular has been extensively studied in relation to sustainability perception—green signals sustainable or eco-friendly packaging (Hoogland et al., 2007; Magnier and Schoormans, 2015; Pancer et al., 2017). Although other visual packaging elements have not been as widely studied as color, consumers do have expectations for the visual design of sustainable foods. Nguyen et al. (2020) found that whereas Vietnamese consumers would purchase “ugly” eco-friendly packaging if they understood its purpose, visually attractive packaging was expected for sustainable products. Steenis et al. (2017) found that a green leaf motif on tomato soup packages increased consumer ratings of the products as more sustainable, natural, and healthy than packages without this element. Finally, consumer responses to verbal claims and visual elements on food packages can be modulated by both other package elements and consumer existing beliefs about sustainability. Magnier and Schoormans (2015) found that among French consumers, including a verbal sustainability claim on mixed nuts packaging decreased purchase intent when the packaging appeared conventional, but increased purchase intent when the packaging design also appeared eco-friendly (mimicking currently available eco-friendly brand packaging). On the other hand, for those
in the study by Magnier and Schoorman (2015) with high sustainability concern, purchase intent increased when either a verbal sustainability claim or an eco-friendly package design was incorporated.

**Labeling**

Although sustainability- or ethics-related labeling is a common practice for the dairy industry, these labels show mixed effectiveness when communicating information to consumers and affecting consumer choice (Grunert, 2011; Grunert et al., 2014). Grunert et al. (2010) outlined 6 barriers to sustainable consumer food choice of products with eco-labels: (1) failure to notice the label, (2) peripheral processing of a label instead of true understanding, (3) incorrect inferences from labels, (4) tradeoffs with other attributes, (5) lack of awareness, credibility, or both, and (6) lack of motivation at the time of choice. Barriers 4 and 5 have already been discussed in this review in the Consumer Desire and Willingness to Pay for Sustainable Dairy section.

To make a purchase decision based on a sustainability label, a consumer must first notice that label. Outside of checking the price, many consumers may skip over label reading entirely for dairy products, especially those they are already familiar with (McKendree et al., 2012; Bir et al., 2019; Schiano and Drake, 2021). Label reading, if it occurs at all, is a quick process; Grunert et al. (2010) found 40% of consumers from 6 European countries took less than 15 s to read a product label before making a decision. The majority of study respondents (62.6%) looked only at the front of package, whereas only 7.7% looked elsewhere (Grunert et al., 2010). Label reading may be affected by consumer demographics and psychographics. For example, Bir et al. (2019) found participants with higher incomes or those with children in their household were more likely to read labels when purchasing fluid milk, which they correlated with the same groups likely to purchase organic products.

Even if a consumer notices a sustainability label, understanding of sustainability- or ethics-related labels is often low (Hoogland et al., 2007; Horne, 2009; Annunziata et al., 2018). Poor understanding of sustainability-related certifications may lead consumers to both undervalue the certifications well as underestimate the effort required by producers to obtain a certification (Hoogland et al., 2007). Schiano et al. (2021) found that among US dairy consumers, certification-related claims (e.g., “USDA organic”) were considered less important to the sustainability of dried dairy ingredients than claims that were simpler to read and visualize (e.g., “cows freely graze on green pastures and organic feed” or “organic for you and the environment”). Hoogland et al. (2007) found similar results when investigating the effect of labeling semi-skim milk with an organic logo or a logo with an additional panel of details among Norwegian consumers. Including the logo alone increased consumer perception of the milk as “better for nature” and “more animal friendly,” adding elaborative details further increased consumer perception of the milk as having these attributes.

Despite these barriers to label use, labels do play a role in product purchase (Janßen and Langen, 2017). Labels and other extrinsic cues, such as brand, are particularly effective at influencing purchase in situations of uncertainty (e.g., product quality is questioned or the product is the subject of a scandal; Janßen and Langen, 2017). Not all consumers may respond to these labels in the same way; Janßen and Langen (2017) found 3 distinct clusters of consumers based on their response to a variety of labels covering all 3 dimensions of sustainability. In addition to an expected price-conscious cluster, 2 clusters prioritized sustainability labeling: one cluster was willing to pay more for any sustainability label, whereas a third was classified as “price-conscious label discriminators.” This third cluster showed significant interactions when labels were shown together, indicating that specific combinations of sustainability labels trigger specific responses in different groups of consumers, and more is not always better when it comes to labeling. One such sustainability label that has been studied extensively is the carbon footprint (CF) label. The CF label is a more recent (and less common) sustainability label that indicates the total amount of carbon dioxide (or carbon dioxide equivalents of other greenhouse gases) produced during the life cycle of a product. Echeverría et al. (2014) studied Chilean consumer responses to CF labels on milk, finding that despite low familiarity (13% of consumers) with these labels, 93% of consumers who received an explanation of the labeling would prefer to see this label on foods. On average, consumers were willing to pay 29.2% of the average price of fluid milk as an additional premium for low CF milk, although WTP decreased as the percent of household budget spent on milk increased. Canavari and Coderoni (2020) investigated Italian consumer WTP for dairy with CF labels. Consumer beliefs affected WTP for these labels; consumers who believed climate change could be combated by purchasing sustainable products were more likely to be willing to pay more for CF-labeled milk, whereas price-conscious consumers were less likely to be willing to pay more.

**Animal Welfare**

Animal welfare is one of the most important factors for sustainability for US dairy consumers (Schiano et
al., 2020). For dried dairy ingredients, a segment of consumers defined sustainability primarily by ideas related to animal welfare (Schiano et al., 2021). A desire to improve conditions for cows was a driving force behind consumption of plant-based milk alternatives (McCarthy et al., 2017; Haas et al., 2019). While there is US legislation that governs the animal welfare of animals in research, exhibition, and transport, these do not extend to animals raised for food or milk unless under specific conditions (USDA-NAL, 2021a). As a result, animal welfare certifications and standards are often put forth by third-party organizations (USDA-NAL, 2021b). Despite their focus on animal welfare, the average consumer has little understanding of these standards or agricultural and food production systems, and forms opinions based solely on marketing cues or their own implicit biases (Ellis et al., 2009; Bennett et al., 2012; Clark et al., 2017). Consumer definitions of animal welfare may also vary, including elements such as appropriate feeding, proper handling, plenty of space, freedom to roam/free range, and environmental cleanliness (Ellis et al., 2009). Tethering or use of tiestalls is a particular area of concern for consumers, the majority of whom consider keeping cows tethered consistently an unacceptable practice (Ellis et al., 2009; Markova-Nenova and Wätzold, 2018). The majority of consumers indicate that they are willing to pay more for dairy products produced with good animal welfare (Ellis et al., 2009; Wolf and Tonsor, 2017). Consumer desire for and WTP for animal welfare may be modulated by a desire to support fair conditions for small farmers in their region (an aspect of social and economic sustainability; Markova-Nenova and Wätzold, 2018). Specifically, the German participants in the study by Markova-Nenova and Wätzold (2018) had a higher WTP for milk from small farms even when tethering was used by those farms. This demonstrates the complex and conflicting motivations consumers have when making ethics-related food decisions, in this case animal welfare versus a desire to support small farmers with limited resources.

**Organic**

Dairy is currently the second most purchased organic food category (after fruits and vegetables; OTA, 2017). The concept of organic farming was developed in the 1940s and gained traction during natural foods-focused counterculture movements in the 1960s and 1970s, but organic milk gained prominence more recently (DuPuis, 2000; Heckman, 2006). Organic milk experienced explosive growth in the 1990s, primarily due to consumer concerns about hormones and antibiotics such as recombinant bovine growth hormone in dairy milk (DuPuis, 2000). For this reason, purchase of organic milk during this period primarily stemmed from a desire to avoid negative milk attributes rather than to achieve a specific positive outcome (such as increased health or sustainability; DuPuis, 2000). In recent years, segments of consumers have shown a preference for organic products relative to other label claims in studies involving a variety of dairy products including fluid milk, chocolate milk, and protein beverages (Kim et al., 2013; Li et al., 2014; Oltman et al., 2015; Harwood and Drake, 2020). Organic products are now associated with sustainability, to the point where consumers may overestimate the sustainability of organic products. For example, Swiss consumers have been shown to underestimate the greenhouse gas emissions produced by organic meat versus conventionally produced meat (Shi et al., 2018). Although organic foods are often investigated in studies of sustainable consumption, sustainable and organic are not interchangeable in the minds of consumers. In a study of Italian yogurt consumers, 43% of respondents considered consuming organic food a very or extremely sustainable action (a lower percentage than considered buying local or fair trade products sustainable; Laureati et al., 2013). Schiano et al. (2020) found that when an organic claim was included on the package of a dried dairy ingredient, dairy consumers were more likely to indicate it was sustainable. However, when dairy product consumers were asked to rank the importance of 63 label claims for the sustainability of dried dairy ingredients, the claim “USDA Organic” was ranked significantly less important than claims, including the term organic, that were simpler to read and visualize (i.e., “organic for you and the environment,” “cows freely graze on green pastures and organic feed”; Schiano et al., 2021). This suggests that the most effective label claims to increase sustainability perception of organic milk are those that incorporate other aspects of sustainability along with organic status. Similarly, when studying production claims on milk and other animal products, Ellison et al. (2017) found that the production claim “organic” was ranked less important than many of the individual components of that production method, such as “no growth hormones” or “no antibiotics.” This may indicate that rather than a true desire for organic products, dairy consumers are instead looking for specific benefits they have come to associate with organic dairy.

Organic foods in general are considered by consumers to be healthier, better for the environment, more ethical for animal welfare and worker rights, and more natural, all attributes that contribute to the consumer perception of food as sustainable (Ellis et al., 2009;
Rana and Paul, 2017). These perceptions go beyond the USDA standards for organic products, which do not specifically reference sustainability or ethics (USDA, 2019, 2021). The USDA organic standards do require that animals have living conditions accommodating natural behaviors, consume only organic food, and are not given antibiotics or hormones, as well as prohibit use of synthetic fertilizers and pesticides or artificial colors and flavors (USDA, 2019, 2021). As a result, many consumers perceive organic milk as safer and more pure than conventional milk, which may lead consumers who define sustainability in terms of simple ingredients and minimal processing to view organic dairy as more sustainable (DePuis, 2000; Schiano et al., 2021). Organic food consumers in general are more concerned with risks related to ingestion (e.g., consuming contaminated drinking water, chemicals in produce) than conventional food consumers, although they are not necessarily more risk adverse in other areas (Hammitt, 1990). In addition to organic status affecting perceived sustainability of dairy foods, consumer-placed importance on sustainability can also affect perception of organic dairy foods. Laureati et al. (2013) found that “sustainable” Italian yogurt consumers had higher expectations for organic yogurts versus conventional yogurts, whereas “unsustainable” consumers showed the opposite response. Italian milk consumers who received information about the sustainability or animal welfare impacts of organic milk were more willing to pay for organic milk versus conventional milk, an effect that was not seen when consumers received information about the increased production costs of organic milk or details about feed and antibiotic usage for cows on organic farms (Scozzafava et al., 2020). This further suggests consumers are not interested in the aspects of organic milk as defined by the USDA organic standards, rather, they are instead interested in sustainability- and ethics-related aspects they have come to associate with organic products.

Grass-Fed and Pasture-Raised

Consumers generally prefer that cows have access to open-air areas (pastures or meadows); however, many consumers may still be unfamiliar with the implications of terms such as “grass-fed” or “pasture-raised” (Weinrich et al., 2014; Peira et al., 2020). Standards for the term “grass-fed” on meat and dairy products are defined by the USDA, and producers can get these claims certified through a voluntary program (USDA-AMS, 2007). However, definitions can become less clear in the case of cows fed mixed diets, which can lead to consumer confusion (Einstein-Curtis, 2019). Despite uncertainty surrounding it, the claim is rapidly growing in popularity for dairy marketing; in 2018, 21% of dairy milk products launched included a grass-fed term on the label (Mintel Group Ltd., 2019). Grass-fed is a universally attractive attribute for fluid milk consumers across different consumer groups (Harwood and Drake, 2018). However, this preference may be partially due to a halo effect resulting from the cognitive overlap of consumer concepts of animal welfare, sustainability, and healthiness. For example, US dairy consumers were more likely to indicate a dried dairy ingredient was sustainable, healthy, natural, trustworthy, and ethical when it was labeled with a grass-fed term (Schiano et al., 2020). Conflation between pasture-raised and organic designations may also influence consumer preference for grass-fed dairy (Harwood and Drake, 2018, 2020). When investigating implicit consumer bias toward fluid milks, Harwood and Drake (2020) found that milk with a USDA organic designation was more often associated with positive implicit responses than pasture-raised milk.

Several studies have investigated consumer WTP for grass-fed dairy. Wolf et al. (2011) measured US milk consumer WTP for several milk production attributes including grass-fed (split into “moderate grazing” and “intensive grazing”), finding inconclusive evidence as to whether consumers were willing to pay for milk from grass-fed cows. The researchers stated that they were unsure whether this was due to a true lack of WTP for this attribute, or instead due to cognitive overlap between grass-fed and other attributes used in the study, such as “milk from family farms” or “organic.” Wong et al. (2010) investigated the WTP for grass-fed milks among consumers in the Southeastern United States, and found that female consumers and those with higher household incomes assigned higher price premiums for these products. In a study of Italian milk consumers, Peira et al. (2020) found that consumers classified as concerned with sustainability or animal treatment had the highest WTP for grass-fed or pasture-raised milk, although those interested in the health benefits of milk were also interested in the claim. Despite the higher price premiums often placed on pasture-raised milk products, producing these milks still results in higher costs as the milk must be collected and processed separately from conventional milk products (Kühl et al., 2017). To provide a new solution, Kühl et al. (2017) investigated European consumer acceptance of 2 alternative label claims which would allow mixing of pasture-raised and conventional milk. One label specified the percentage of pasture-raised milk in the package while the other used a cause-related marketing approach to emphasize how purchase of the milk financially supported fam-
ers who raise their cows on pasture. While consumers preferred a label declaring the milk to be 100% pasture-raised cows (with a WTP of €0.50), the cause-related marketing label was also accepted (with a WTP of €0.38). The percentage label was the least preferred, with most consumers who rejected the label doing so due to distrust or skepticism (Kühl et al., 2017). These results suggest that alternative marketing and labeling approaches may provide conventional dairy farmers more opportunities to stay competitive in a changing marketplace. However, careful research is necessary to ensure these new efforts are well received.

**Local**

Local itself is a poorly defined term with a variety of definitions and use cases (Hand and Martínez, 2010; Onozaka et al., 2010). In a survey of Italian yogurt consumers, Laureati et al. (2013) found the majority of respondents indicated buying local food or zero-mile products was a very or extremely sustainable action (62% and 60%, respectively). Although local is a desirable attribute for dairy, consumers tend to ignore or underestimate the sustainability impact of energy requirements for transport of other dairy products (Van Dam, 1996; Nordin and Selke, 2010; Lindh et al., 2016; Steenis et al., 2017). When asked to rank the importance of 27 attributes to the sustainability of dairy products, “Shipped with minimal cold chain” was ranked one of the lowest, despite “locally produced” ranking significantly higher (Schiano et al., 2020). However, some plant-based milk consumers may doubt the sustainability of plant-based dairy alternatives made from crops grown outside the country due to long transport distances (Haas et al., 2019). Coconut milk, for example, is perceived as less sustainable than nut or plant milk alternatives by both consumers who purchase exclusively dairy milk and those who purchase both dairy and plant alternative milks (Schiano et al., 2020). More research is needed to understand if consumers of plant-based dairy alternatives consider ingredient transport distances while evaluating products, and if so, how it affects their sustainability perception. Consumer desire for local dairy is more closely tied to motivations to support farmers and the local economy, a motivation that is not shown for consumption of plant-based beverages even when the crops used to produce it are grown locally (Onozaka et al., 2010; Haas et al., 2019). This may be due to a general desire of local food purchasers to support specific outcomes (e.g., maintaining local farmland and giving farmers fair wages) versus more complex, less clear claims (e.g., reducing environmental damage; Onozaka et al., 2010).

**Clean Label**

While there is no regulatory definition of “clean label,” the term is often used to refer to products which use limited processing and limited ingredients which are easy to understand and are found in nature (Asioli et al., 2017). A desire for sustainability is one factor contributing to the growth of the clean label trend (Sautron et al., 2015; Asioli et al., 2017; Maruyama et al., 2021). Schiano et al. (2021) found that a segment of dairy consumers defined sustainable dried dairy ingredients as those that contained simple ingredients and were produced with minimal processing, which may relate to the clean label trend. However, there is no clear pattern to which ingredients in dairy products consumers accept as clean label. In yogurts, perception of ingredients as natural and acceptable varies by ingredient and category of ingredient, with stabilizers and thickeners generally perceived as less natural and acceptable (Maruyama et al., 2021). Providing consumers information about the source of the ingredients improved perceived naturalness and acceptability, but providing information on the technical function of the ingredient in the product did not (Maruyama et al., 2021). Sustainability associations may also connect plant-based ingredients to the clean label movement and cause consumers to overlook processing methods or off-flavors. For example, Danish consumers were less likely to indicate frozen desserts and protein shakes made with protein powder had unpleasant flavor when the products were framed with sustainability information (Aschemann-Witzel et al., 2019).

**CHALLENGES OF MARKETING SUSTAINABLE DAIRY**

**Avoiding Consumer Backlash**

When consumers are kept unaware of dairy industry practices, the potential for miscommunications and misunderstandings surrounding sustainable dairy grows (von Keyserlingk et al., 2013). If industry efforts misalign with consumer expectations for sustainable dairy, consumers may become confused, or worse, feel misled. “Greenwashing” (the practice of a company attempting to make their products or practices appear more sustainable than they actually are) or other misrepresentation of sustainability efforts can easily lead to consumer backlash (Lyon and Montgomery, 2013; Toptal et al., 2019). When weighed against potential publicity pitfalls, understanding consumer definitions of sustainability and related terms takes on new importance. It is not difficult to imagine a scenario in
which consumers and businesses (or even different units within the same business) define sustainability differently, leading consumers to believe they have been misled because product messaging does not align with their own perceptions. Furthermore, although product packages are a major source of sustainability information for dairy products, consumers may seek sustainability information across a wide variety of channels, including advertisements, websites, and social media; both affiliated and unaffiliated with food producers (Schiano et al., 2020). Thoughtful creation of marketing messaging across all channels to educate consumers about industry practices and dairy processing may help to increase confidence in and positive perception of the industry. For example, including interactive website elements (such as hyperlinks and expandable/collapsible elements) to provide sustainability evidence without interfering with design has been shown to reduce perceived greenwashing on corporate websites (Szabo and Webster, 2020).

**Marketing Dairy Amidst the Growth of Plant-Based Alternatives**

Efforts to promote sustainable dairy must consider that dairy foods have historically been marketed as a commodity, with little perceived variation between brands and offerings. As the market has expanded and nonconventional variants such as organic, grass-fed, local, and ultrafiltered have risen in prominence, there is a tendency to position these products as competitors to plant-based dairy alternatives, which consumers are more likely to consider sustainable than their dairy counterparts (Schiano et al., 2020). However, there is inherent risk that promoting these alternatives as “better” than conventional dairy will ultimately harm sales of conventional dairy and the industry overall. Analyzing Nielsen Homescan Panel data, Alviola and Capps (2010) found that organic and conventional milk were substitutes for one another, thus increased sales of organic milk decrease sales of conventional milk (although differences in price sensitivity can complicate this relationship in the case of changing prices). Kanter et al. (2009) found a similar effect for recombinant bST-free and organic milk, concluding that the labeling resulted in a negative net economic result for producers by reducing consumer WTP for conventional milk. Attempting to compete with plant-based alternatives by positioning only nonconventional dairy as sustainable could widen the gap between conventional products and these growing alternatives. In addition, this could reinforce perceptions that only nonconventional dairy can be sustainable. Currently, consumer perceptions of conventional dairy as sustainable, particularly as a response to marketing messaging, are not well understood. More research is needed to better understand how to strategically position and market conventional milk products.

Marketing efforts for food products typically take one of 2 forms—generic marketing (aiming to promote the category as a whole) and brand marketing (aiming to promote a particular branded product). In the dairy industry, examples of generic marketing campaigns include “Got Milk” and “Real California Milk,” while a social media ad for a specific brand of yogurt would be an example of brand marketing. The relationship between generic marketing and fluid milk sales has been previously studied, although further research is needed to understand the nuances in these relationships with the inclusion of competitor marketing from plant-based alternatives (Hall and Folk, 1983; Capps and Schmitz, 1991; Schmit et al., 2002). Generic marketing campaigns, such as those directed by Dairy Management Inc., are effective at encouraging category sales (Capps and Schmitz, 1991; Schmit et al., 2002). However, brand advertising has its purpose; for example, Hall and Folk (1983) found brand advertising was twice as effective at increasing yogurt consumption than generic advertising. Although these studies provide insight into the effectiveness of marketing, there is a lack of recent studies published on this topic. Updated research is needed not only to document the current effectiveness of dairy marketing, but to understand how these strategies must be adjusted amidst the growth of plant-based alternatives. The dairy industry has established programs for generic advertising, but plant-based alternatives do not yet have the same infrastructure (for point of reference, the Plant Based Foods Association was founded in 2016). As a result, many plant-based alternatives rely primarily on brand marketing efforts. Few scholarly data are available to suggest whether a primarily brand-focused marketing approach will increase sales in the plant-based category more than a primarily generic-focused approach; this issue represents a stark difference in how dairy products and plant-based alternatives are shown to consumers. In a classic metaphor, brand marketing is described as working to increase a particular brand’s “slice of the pie” (sales in a category), whereas generic marketing works to increase the overall “size of the pie” (sales of the category overall). But what does it mean for dairy producers now that many consumers consider plant-based alternatives part of the same pie? The previous research described above demonstrates how past generic advertising increased dairy sales. However, we do not know how similar generic marketing campaigns will fare now that plant-based alternatives are common.
Brand marketing efforts should be investigated as a potential way to increase sales of dairy products amidst this competition; however, more research is needed to understand the ideal distribution of generic and brand efforts as well as consumer preferred messaging and channels for dairy marketing.

SUMMARY

Sustainability is often conceptualized using 3 pillars—environmental, economic, and social (Figure 1, top). Disconnects between consumer and industry definitions create the potential for misunderstandings and frustration on both sides. The dairy industry as a whole has focused primarily on agricultural practices that address environmental and economic sustainability. Consumer perceptions, which are often founded entirely on preexisting subconscious biases, incorporate all 3 dimensions of sustainability as they apply to dairy foods (rather than the agricultural practices themselves) in ways dairy producers might not expect (Figure 1, bottom). In addition, consumers are not unified in their perceptions of sustainability. Not only do demographics and psychographics heavily affect sustainability importance and perception, but perceptions can vary between categories and between products within a single category. A growing consumer desire for sustainability is reflected in the growth of plant-based alternatives. Nonconventional dairy (such as organic, grass-fed, and local) has often been positioned in competition with these nondairy alternatives; however, switching from conventional milk to these products is not a trivial or feasible switch for most farmers. While promoting nonconventional dairy as a sustainable alternative may increase sales in the short term, it may ultimately harm the industry in the long term by reducing consumer opinion and WTP for conventional dairy. Instead, the dairy industry should consider a consumer-centric approach and the use of strategic marketing efforts to educate consumers about industry practices that positively affect consumer perception in light of competitive marketing from plant-based alternatives. More research is needed to understand the best messaging and ways of communicating sustainability-related dairy information.

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