Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

Making sense of the "clean label" trends: A review of consumer food choice behavior and discussion of industry implications

Daniele Asioli[a,b,h,*], Jessica Aschemann-Witzel[c], Vincenzina Caputo[d], Riccardo Vecchio[e], Azzurra Annunziata[f], Tormod Næs[a,g], Paula Varela[a]

[a] Consumer and Sensory Science, Division of Food Science, NOFIMA AS, Ås, Norway
[b] School of Economics and Business, Norwegian University of Life Sciences, Ås, Norway
[c] MAPP Centre, Research on Value Creation in the Food Sector, Aarhus University, Aarhus, Denmark
[d] Department of Agricultural, Food and Resources Economics, Michigan State University, East Lansing, United States
[e] Department of Agricultural Sciences, University Federico II, Naples, Italy
[f] Department of Economic and Legal Studies, University of Naples Parthenope, Naples, Italy
[g] Department of Food Science, University of Copenhagen, Copenhagen, Denmark
[h] Department of Agricultural Economics and Agribusiness, University of Arkansas, Fayetteville, United States

ARTICLE INFO

ABSTRACT

Consumers in industrialized countries are nowadays much more interested in information about the production methods and components of the food products that they eat, than they had been 50 years ago. Some production methods are perceived as less "natural" (i.e. conventional agriculture) while some food components are seen as "unhealthy" and "unfamiliar" (i.e. artificial additives). This phenomenon, often referred to as the "clean label" trend, has driven the food industry to communicate whether a certain ingredient or additive is not present or if the food has been produced using a more "natural" production method (i.e. organic agriculture). However, so far there is no common and objective definition of clean label. This review paper aims to fill the gap via three main objectives, which are to a) develop and suggest a definition that integrates various understandings of clean label into one single definition, b) identify the factors that drive consumers' choices through a review of recent studies on consumer perception of various food categories understood as clean label with the focus on organic, natural and 'free from' artificial additives/ingredients food products and c) discuss implications of the consumer demand for clean label food products for food manufacturers as well as policy makers. We suggest to define clean label, both in a broad sense, where consumers evaluate the cleanliness of product by assumption and through inference looking at the front-of-pack label and in a strict sense, where consumers evaluate the cleanliness of product by inspection and through inference looking at the back-of-pack label. Results show that while 'health' is a major consumer motive, a broad diversity of drivers influence the clean label trend with particular relevance of intrinsic or extrinsic product characteristics and socio-cultural factors. However, 'free from' artificial additives/ingredients food products tend to differ from organic and natural products. Food manufacturers should take the diversity of these drivers into account in developing new products and communication about the latter. For policy makers, it is important to work towards a more homogenous understanding and application of the term of clean label and identify a uniform definition or regulation for 'free from' artificial additives/ingredients food products, as well as work towards decreasing consumer misconceptions. Finally, multiple future research avenues are discussed.

1. Introduction

During the last century, industrialized countries have overcome lack of food security with the key contribution of agrifood industrialization (Lusk, 2016; Meneses, Cannon, & Flores, 2014). Food processing has played a crucial role as it allowed extending the shelf life of food products, reduced food losses and waste, as well as improved nutrient availability and optimization (Augustin et al., 2016; Fellows, 2004; Weaver et al., 2014). However, day-to-day consumer perception focuses on other aspects than these achievements. In modern societies, the increasingly globalized markets and greater processing in the food chain has contributed to a perceived distance and knowledge gap between

people and food manufacturers (e.g. how food is produced, where is it produced, etc.) (Princen, 1997; Weis, 2007).

Industrialization and globalisation go hand in hand with a higher and more man-made risk, which increases citizens' perception of risks of modernity (Beck, 1992). For instance, food contamination accidents have affected Europe in the last decades, such as BSE[1] and dioxin (Bánáti, 2011; Knowles, Moody, & McEachern, 2007). Consumers are concerned about the heavy use of pesticides in the conventional and intensive agricultural practices (Aktar, Sengupta, & Chowdhury, 2009), the use of artificial ingredients, additives or colourants such as E133 (Lucová, Hojerová, Pažoureková, & Klimová, 2013), and the adoption of controversial food technologies like GMOs[2] (Grunert, Bredahl, & Scholderer, 2003). This has prompted consumers to become skeptical or worried about adverse health effects entailed in this food system (Meneses et al., 2014). Moreover, the growing public concern about the contribution of the food system to climate change and its overall negative effects on sustainability (Godfray et al., 2010) have led consumers to question the environmental and social consequences of food production (Asioli et al., 2014; Caputo, Nayga, & Scarpa, 2013).

Consumer's choose foods to be satiated and fed with nutrients, other important drivers are flavor and price (Lynn Jayne Frewer & van Trijp, 2007; MacFie, 2007). However, it is often proposed that today's food consumption in industrialized societies is particularly affected by three major trends: health concerns, sustainability, and convenience (Grunert, 2013). Health concerns are driven by consumers' affluence, but also explained by the increasing number of food and lifestyle related diseases (i.e. diabetes, obesity, etc.) (Kearney, 2010; Weis, 2007) and allergies and intolerances towards some specific food products or components such as gluten. These factors have encouraged consumers to be more interested in healthy food products that support healthy lifestyles into older ages and reduce the risk of certain diseases. Sustainability interest is explained by the growing awareness of environmental pollution caused by conventional agricultural practices. This has resulted most prominently in an increased expansion of organic agriculture and markets (Aschemann, Hamm, Naspetti, & Zanoli, 2007) and might also explain why consumers are looking for e.g. 'local food' products (food miles) (Adams & Salois, 2010) and are willing to pay higher prices for water-saving products (Krovetz, 2016). Convenience relates to the number of meals that are eaten out-of-home or home-delivered compared to home-made. This number has dramatically increased during the last decades (Lachat et al., 2012), which signifies that consumers are interested in added characteristics of food products that save time (e.g. frozen food, ready meals, microwavable, etc.).

The trends of healthiness and sustainability have triggered consumers into considering which components are used in the food products that they eat in everyday life (Euromonitor International, 2016). A new trend in food products has emerged, which is often summarized under the umbrella of the so-called "clean label" (Cheung et al., 2016; Joppen, 2006; Varela & Fiszman, 2013; Zink, 1997) and has been taken up by a multitude of food industry stakeholders (Osborne, 2015). The term clean label itself appeared for the first time during the 1980s when consumers started to avoid the E-numbers[3] listed on food labels because they were allegedly associated with negative health effects (Joppen, 2006). However, the use of the term clean label dramatically exploded ten years ago. One of the leading food science journals, "Food Technology Magazine," cited the term "clean label" twice in 2000, 18 times in 2011 and 77 times in 2016 in their articles, clearly indicating a growing importance of the term (Swientik, 2017).

The food industry has started to respond to the increasing consumer demand of such clean label products by supplying food products that are perceived as 'cleaner' (Katz & Williams, 2011). For example, in 2010 *Heinz* tomato ketchup was reformulated to remove high fructose corn syrup from the ingredient list and was renamed as *Simply Heinz* (Katz & Williams, 2011). Recent data shows that during 2013, almost 27% of the new packaged food products launched in Europe had some sort of clean label (Ingredion, 2014).

Despite the increasing market shift towards clean label food products and a large number of different studies that have investigated goods carrying clean label, it is not yet clear what a clean label exactly means. So far, a jointly agreed upon definition or specific regulations/legislations does not exist (Busken, 2013; Joppen, 2006; Varela & Fiszman, 2013), leaving the interpretation as rather subjective for consumers and food practitioners. A clear definition of clean label that can improve understanding of consumer perception and behavior, guide manufacturers in food development and communication, and support policymakers' efforts in providing a targeted regulatory framework is needed (Katz & Williams, 2011). Moreover, to the best knowledge of the authors, a coherent overview of the factors that affect consumers' perception of food products that are related to the clean label trend does not exist (Cheung et al., 2016; Zink, 1997).

This paper reviews the literature from the last six years on consumers' perceptions and preferences of selected food categories understood as clean label products, aiming to (i) provide a holistic definition that integrates various understandings of clean label into one single definition; (ii) identify the main drivers that motivate consumers to choose clean label products, and (iii) derive implications for food manufacturers, policy makers and future research avenues. The overall goal of this paper is to advance the understanding of how the clean label trend is viewed by both consumers and food industry professionals and to advance research into this trend based on a common definition.

In Section 2, we briefly describe some important theoretical issues related to consumer behavior as background for understanding the basic processes of consumer decision making. Then, we suggest a definition of clean label based on consumption trends observed in various food markets and the underlying consumer behavior theory. We then outline the literature review methodology and present the results of the review on the factors that affect consumers' choice behavior for such products. The paper concludes with a discussion of industrial and policymakers' challenges, the implications of the findings, and future research needs and directions.

2. Consumer behavior theoretical background

Looking at related theories or theoretical terms can help understanding why consumers show an increasing interest in clean label, and it can help to understand the role that consumer perception plays in explaining this trend. We regard two distinctions as particularly relevant for explaining the consumer behavior driving the clean label trend. Firstly, we consider dual-processing theories which differentiate between two modes of processing called central and peripheral processing. Secondly, we consider the distinction of goals as either approach or avoidance goals, and the related individual trait of being oriented towards promotion or prevention orientation. Both will be briefly introduced and their contribution to explaining consumer interest in clean label products discussed. Afterwards, when presenting our definition and categorization of clean label, we will refer to these theories to support the categories of clean label that we suggest.

2.1. Dual-processing theory

It is broadly acknowledged that consumer food choices are typically conducted in an environment of information overload (Mick, Broniarczyk, & Haidt, 2004). This holds true even more today than 5–10 years ago, given that supermarket assortments are growing and

---

[1] Bovine Spongiform Encephalopathy.

[2] Genetically Modified Organisms.

[3] E-numbers are the code numbers used to identify food additives in EU. E-numbers have been shown to be safe and officially approved for use in food across the EU (i.e. E202 is the Potassium sorbate) (Emerton & Choi, 2008). This nomenclature has been extended worldwide to the Codex Alimentarius Commission (Carocho, Barreiro, Morales, & Ferreira, 2014).