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Analysis

Content Analysis of TV Food Advertising Using Climate Impact and a Nutritional Impact Index

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ABSTRACT

In this study, we conducted a comprehensive content analysis of the distribution of television advertising time among various food items from the perspective of sustainability. We employed the food item sustainability index published by van Dooren et al. in 2017 that uses climate impact as the ecological indicator and nutritional characteristics as the public health indicator. For a period of 12 months, we videotaped advertisement from two most popular Finnish channels 24 hours of television broadcasting per day on the third day of every month. We identified a total of 2,394 food commercials. We analysed a total of 742 minutes of food advertising time. We found that commercials were dominated by three food items: yogurt (16 per cent of advertising time), bread (14%) and cheese (10%). The food items with the lowest climate impact and highest positive nutritional characteristics received only seven per cent of the total advertising time and the ones with the highest climate impact and lowest nutritional characteristics received 29 per cent. Our results indicate that food advertising on television is not beneficial seen from a sustainability perspective. Regulation – or even banning – of advertising for most harmful food items should be considered.

1. Introduction

Over the past few decades, tremendous changes have taken place in the way we produce and consume food. With the growing population, the emphasis in the production end of the system has been on increasing production. This increase has come at a high price. Currently, the agricultural system is responsible for about one-fifth of all global greenhouse gas emissions (Vermeulen et al., 2012; Steinfeld et al., 2006), the majority of our freshwater usage (Hoekstra and Mekonnen, 2012) and a vast amount of the current biodiversity reduction (Machovina et al., 2015). At the same time, at the consumption end of the system, people's nutritional needs have been transformed. The world has changed from one in which many people have too little to eat to one in which unhealthy diets and too-high bodyweight are major health problems (Stein, 2010; Popkin et al., 2012; Ng et al., 2014).

The scale of agricultural production and problems with consumption has led to research that analyses both environmental and health issues at the same time (Tilman and Clark, 2014; van Dooren et al., 2014; Aleksandrowicz et al., 2016; Springmann et al., 2016; van Dooren et al., 2017). This body of research offers a good starting point for an analysis of how to guide the food system. In this article we use the term *sustainability* to capture all these aspects of food consumption, health and ecology.

Previous research has proposed restraining demand as a possible solution in achieving a more sustainable food system (Garnett, 2014). For example, strategies have been presented to limit consumption of the most harmful foods (McMichael et al., 2007). Other methods of regulation, such as limiting the advertisement of certain food items, have also been discussed (Lang et al., 2009; Brambila-Macias et al., 2011; Vinnari and Vinnari, 2014). Studying advertising has been seen as vital, because it can have an influence on people's food-consuming behaviour. This is why we used food advertising as our research data, in order to find out what kind of advertising consumers are exposed to.

Previous research has analysed the content of television food advertising, for example in the USA (Story and Faulkner, 1990; Byrd-Bredbenner and Grasso, 2000; Henderson and Kelly, 2005), Australia (Chapman et al., 2006), Canada (Cervellon and Dubé, 2000), Italy (Puggelli and Bertolotti, 2014), South-Africa (Mchiza et al., 2013) and Turkey (Akçil Ok et al., 2015). These studies show that television advertising includes a great deal of advertising for fast food, beverages and sweet foods such as chocolate and desserts. Because of these findings, there have been worries especially about children's exposure to advertising for unhealthy foods (Caraher et al., 2006; Matthews, 2008; Keller and Schulz, 2010; Royo-Bordonada et al., 2016).

Although a considerable amount of literature has been published on television food advertising and the healthiness or unhealthiness of the foods advertised (Byrd-Bredbenner and Grasso, 2000; Chapman et al., 2006; Keller and Schulz, 2010; Adams et al., 2011; Pettigrew et al., 2012; Puggelli and Bertolotti, 2014; Royo-Bordonada et al., 2016), a more comprehensive approach to food advertising is needed. Previous approaches have some limitations, especially from the perspective of

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sustainability analysis, as they do not consider the ecological aspects of food. Additionally, also the categorizations of the healthiness and unhealthiness of some individual food items have been problematic from a sustainability point of view. Food items have most often been coded as healthy or unhealthy according to the categories that derive from the national food recommendations (Byrd-Bredbenner and Grasso, 2000; Chapman et al., 2006; Mink et al., 2010; Pettigrew et al., 2012). In this type of categorization, animal products such as meat and dairy products can be defined as healthy and, as such, beneficial, which is problematic from a broader sustainability perspective and from a health perspective as well. Additionally, another problem can arise when high-fat foods are defined as unhealthy: this approach does not take into account food items that include fats good for the health, such as vegetable oils, nuts and margarines (Dickinson, 2000; Chapman et al., 2006; Pettigrew et al., 2012). As such, a more fine-grained methodology that leaves the selection of food more open is needed.

In this study, we used a different methodological approach to avoid the problems described above and utilized sustainability index developed by van Dooren et al. (2017) that used a nutrient density as a public health indicator and climate impact as an environmental indicator. As such, this article will provide information about the content of television food advertising from this sustainability perspective. To target possible guidance and limitations accurately, it is important to know also whether there are differences between the various advertisers in their allocation of advertising time to the different product groups from a sustainability perspective. Therefore, we also examined how the total advertising time was distributed among the various actors in the food system and whether there was a concentration of advertising time dedicated to advertising from a few companies.

Specific research questions are:

1. How much TV advertising time is devoted to the various food items as categorized by their sustainability ranking?
2. How is the TV advertising time distributed among the various advertisers – i.e. food manufacturers, the retail sector and restaurants – from a sustainability point of view?

2. Research Context, Data and Methods

2.1. Empirical Context

Our data derives from food advertising broadcast on Finnish television. Finland offers interesting context for this study, as the percentage of the population that are overweight is higher in Finland than in any other Nordic country, and the consumption of saturated fats is high and the consumption of vegetables low (WHO, 2013). This is the case even though Finland previously implemented one of the only effective public health programmes to facilitate lifestyle changes (the so-called North Karelia project), a programme aimed at decreasing chronic noncommunicable diseases by reducing people's butter usage and their smoking (Puska et al., 2009). As such, Finland has experience in implementing policies that change consumer consumption behaviour.

In Finnish food culture, some specific aspects are relevant from a sustainability viewpoint. Overall, from an ecological and public health perspective, Finnish food consumption is not optimal. First and foremost, greenhouse-gas-intensive meat and dairy products are an essential part of Finnish food culture (Sillanpää, 1999; Usva et al., 2008; Virtanen et al., 2011).

Although in recent decades, the food culture of other countries has influenced Finnish cuisine and brought new foods to Finnish tables, traditional national foods have maintained their status to some degree. Meat has a high cultural status and animal-origin food items dominate agricultural policies (Konttinen, 2011). Additionally, Finns consume higher-than-recommended amounts of products containing high concentrations of saturated fat, especially dairy and meat products (Helldán et al., 2013). In addition to eating too much of animal products, the Finns eat less vegetables than is recommended (Latvala, 2012; Niva et al., 2014).

Besides meat and dairy, grain products such as bread are also an important part of Finnish cuisine. The centricity of these food items is also reflected in the structure of the Finnish food industry. The country's main industries are the production of dairy products, meat products, and grain and bakery products, as well as the processing and preserving of fruits and vegetables (Ruokatieto, 2016, 41). The largest food company in Finland in terms of turnover is the dairy company Valio Oy. After that come HKScan Finland Oy and Atria Suomi Oy, which produce meat, meat products and convenience foods; the dairy company Arla Oy, a subsidiary of international company Arla Foods; and Fazer Makeiset Oy, which makes chocolate and other sweets (Hyrylä, 2016, 74).

To interpret the results below accurately, it is also worth noting that the Finnish retail trade has certain unique features. The Finnish food retail trade is basically concentrated in the hands of two major actors that have Finnish origins: S-group, which has the largest market share in Finland (46%), and K-group, which has the second-largest market share (33%). Additionally, the European company Lidl has a market share of 9% and Suomen Lähikauppa Oy 7% (PTY, 2016).

2.2. Data Gathering

To analyse which food items had the greatest amount of television advertising time from the perspective of sustainability, we gathered data in the form of food advertising broadcast on Finnish television. Our research data derives from TV advertisements from the two most popular Finnish commercial television channels: MTV3 and Nelonen. In Finland, the publicly funded channels (Yle), which do not broadcast commercial material, have a large audience share. However, especially the two largest commercial channels also enjoy substantial audience numbers. Of the total of 3 h a day that Finns on average watch television, about half of it is on commercial channels. In 2012, when our data collection started, 83% of people ten years or older watched MTV3 and 76% watched Nelonen at least once a week (Sandell, 2013). The data was recorded between July 2012 and June 2013.

Despite the fact that previous studies examining food advertising in magazines show that there is a seasonal differentiation in the amount of advertising for different food products (e.g. Adams et al., 2011), the possible impact of the time of year is not examined in previous television food advertising studies. Instead, the common procedure was to collect data only from a certain time period, for example one week or month in a year. Therefore, the possible effect of the season was not taken into account. Additionally, the data was also usually recorded only at certain times of day, e.g. prime time and/or weekend mornings (Dickinson, 2000; Chapman et al., 2006; Mink et al., 2010; Pettigrew et al., 2012).

In this study, to ensure a representative selection of advertisements, 24 h of television broadcasting a day were recorded from each of the two channels for a period of 12 months. The data were recorded on the third day of every month, so they include advertising from weekdays, weekends and all seasons. This approach was chosen to ensure that a good overall picture of Finnish TV food advertising – which had not been studied to this extent before – would be achieved. In addition, although advertisements broadcast in prime time reach a larger audience, age is one of the factors that influences television watching times. This approach ensured that the data included advertising that reached all age groups, including children, for example.

A total of 576 h of television broadcasting were recorded. After that, each commercial break was stored as an individual file. After the commercial breaks were watched, each advertisement was coded as either a food advertisement or a non-food advertisement. Although all the commercials were recorded, only those advertising foods were analysed. The following information was coded from each food commercial: 1) how many times the advertisement occurred in the overall data, 2) the company and brand name of the advertised product(s), 3) the type of advertising company (food manufacturers/retailer/restaurant/other), and 3) the duration of the advertisement.

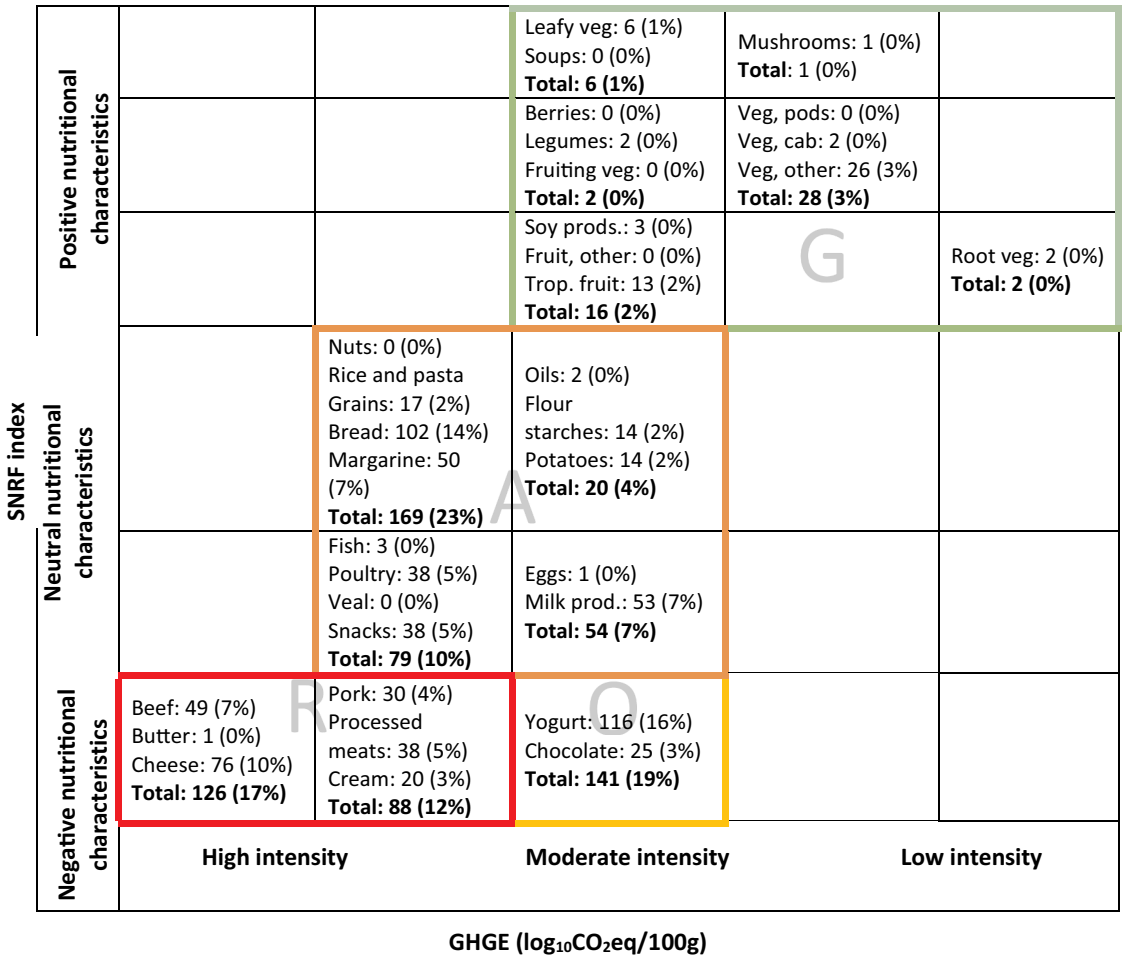


Fig. 1. Advertising times for different food items in absolute values (minutes) and relative values (percentages) grouped according to their nutritional characteristics (as measured by the Sustainable Nutrient Rich Food index, SNRF) and their climate impact (measured as greenhouse gas emissions [GHGE] intensity).

2.3. The Coding Procedure

To identify which food product categories received the most TV advertising time from the perspective of sustainability, we coded the advertised foods according to the food categories employed by van Dooren et al. (2017). A major advantage of this model is that it quantifies the relationship between the climate impact of food items and their nutritional characteristics, ensuring that the ecological aspects of food consumption are taken into account. The van Dooren et al. study shows that there is a relationship between low greenhouse gas emissions and high nutrient density, so eating both healthy and sustainable food can be combined relatively easily.

For their categorization, van Dooren et al. rank food items according to their nutritional density, favouring products with a high concentration of certain macronutrients (for example proteins and fibre) and low concentrations of other macronutrients (such as saturated fats and sugar) to form an SNRF index. To estimate the environmental impact, they use greenhouse gas emissions (GHGE), as they are strongly correlated with other environmental emissions. They then divide the foods into three different categories according to their sustainability ranking: **green**, **amber** and **red**.

Green category food items feature low greenhouse gas emissions and high nutritional characteristics, amber category feature moderate greenhouse gas emissions and moderate nutritional characteristics, and red category high greenhouse gas emissions and low nutritional characteristics. In addition to the categories employed by van Dooren et al. (2017), we added **orange**, a category of products featuring high greenhouse gas emissions and a moderate nutritional value. This category was used in the van Dooren et al. study, but it was not named, and it contained chocolate and also yoghurt, which as a dairy product plays a significant role in Finnish food culture.

During the coding procedure, 50 advertisements were excluded because the advertised product(s) could not be identified accurately. An additional 175 advertisements were excluded because the food items advertised were not included in the food categories used. The overall data comprised 2169 advertisements (371 different advertisements). The total duration of these commercials was 742 min.

More than one foodstuff was advertised in 19% (n = 404) of the commercials, which included advertisements from the retail sector, food manufacturers and restaurants. Unlike in many other previous studies (Furnham and Li, 2008; Prell et al., 2011), these advertisements were not excluded from the data: instead, their total duration time was distributed among the advertised food products. For example, if the advertisement's total duration time was 30 s and three different food items were advertised, 10 s of advertising time was coded for each item. The same procedure was used for the restaurant foods. If more than one food item was advertised, e.g. hamburgers and French fries, the total duration time was divided between them. The benefit of this approach is that it controls for bias that can occur if the commercials that advertise multiple products differ in some way from the commercials that advertise only one kind of product.

A total of 20% (n = 438) of the foods advertised were made up of multiple food ingredients. This kind of product was for example convenience food and restaurant food. To identify the composition of these foods, product ingredient information was gathered from food producer websites and from the internet service on Foodie.fi. Foodie.fi is a

database run by the food retailer S-group, whose shops have a food product assortment very similar to that of other Finnish food store chains. Additionally, the companies themselves were asked directly for information.

Once the information was gathered, the three main ingredients (except water) were coded for each food product. For each main ingredient, the advertising time was coded according to the percentage of the ingredient contained in the total product. However, for this purpose, the percentages were calculated so that the total sum of the three main ingredients was 100%. For example, based on the nutritional information obtained, liver casserole consisted of 80% rice and 12% pork liver. The third main ingredient, syrup, was given the remaining 8% of advertising time, although in actuality the liver casserole also included other ingredients such as spices.

In cases when the precise relative share could not be calculated because of insufficient information, the following procedure was used: the percentage of main ingredient was estimated to be 50%, and each of the second and third ingredients was assigned 25%. As a result of this procedure, in some cases it was possible that especially the third ingredient's percentage was defined as higher than it actually was. Since there were only a few of these kind of foods included in the data overall, this should not distort results significantly.

The results are presented below, in the following sections. First is a description of the total advertising time of each food item and food category. The distribution of advertising time among different advertisers (food producers, the retail sector and restaurants) is also described.

3. Results

3.1. The Most Advertised Food Items on Finnish Television From the Perspective of Sustainability

The data comprised a total of 11,158 advertisements, 2394 of which were food commercials, i.e. 21% of the commercials were advertising food. Each advertisement was shown, on average, a total of six times, ranging between one and 32 times. The food item that was advertised 32 times was bread. The duration of food commercials ranged between five and 45 s, and the average duration was 21 s. Chocolate and potato chips were the food items that were advertised for 45 s.

When the total advertising time (742 min) was divided into four different groups based on climate and nutritional characteristics, it became evident that TV food advertising time in Finland was distributed quite unequally (see Fig. 1).

What stands out in Fig. 1 is that the largest share of advertising time (45%) was allocated to amber foodstuffs, followed by foodstuffs in the red category (29%). Advertising allocated to green-category products was just 7%. What is also evident from the analysis is that the products in the group with the lowest greenhouse gas emissions and the group with the highest nutritional value – such as leafy vegetables, root vegetables and mushrooms – received very little TV advertising time. For example, root vegetables, which have the lowest greenhouse gas emissions, received only 2 min of advertising time.

As Fig. 1 shows, the greatest amount of advertising time per food item was allocated to yoghurt (116 min, 16% of total advertising time), followed by bread (102 min, 14% of total advertising time) and cheese (76 min, 10% of total advertising time; see Fig. 1). These three food items totalled 40% of the TV advertising time in our sample. This is rather large share, as the analysis included 31 other food items as well.

What also stands out in the table is that meat products (beef, pork, processed meats, fish and poultry) received a total of 158 min of advertising time, which is 21% of the total advertising time. Additionally, milk products as a whole (butter, cheese, creams, yoghurt, chocolates and other milk products) received 291 min of advertising time, which is a striking 39% of the total advertising time.

Table 1
Advertisement time in minutes (and percentages) on Finnish television distributed by climate impact and nutritional characteristics.

	Manufacturers minutes (%)	Retailers minutes (%)	Restaurants minutes (%)	Total minutes (%)
Green	20 (37)	26 (48)	8 (15)	54 (100)
Amber	238 (72)	41 (12)	53 (16)	332 (100)
Orange	136 (96)	5 (4)	0 (0)	141 (100)
Red	130 (60)	62(29)	23 (11)	215 (100)
Total	524 (71)	134 (18)	84 (11)	742 (100)

Green = low-intensity climate impact + positive nutritional characteristics; Amber = moderate intensity climate impact + neutral nutritional characteristics; Orange = high-intensity climate impact + neutral nutritional characteristics; Red = high-intensity climate impact + negative nutritional characteristics.

3.2. The Differences in Advertising Times of Different Advertisers

To reveal the differences in advertising times of the different actors in the food system, we identified and coded each advertiser as a food manufacturer, retailer, restaurant or other. The “other” group comprises 30 s of advertising time purchased by the federation of fruit and vegetable producers, which is a national sectoral organization for entrepreneurs in the field. Because its advertising time is under 1 min, it is not included in the tables or figures below.

As Table 1 shows, food manufacturers dominate Finnish food advertising. They are responsible for 71% of all TV advertising in Finland. Retailers are responsible for 18% of advertising and restaurants 11%.

Especially dominant food manufacturers are in the orange category (yoghurts and chocolates), where they are responsible for 96% of the advertising time. In the red category, food manufacturers are accountable for 60% of the advertising time. The only category of food items in which food manufacturers are not responsible for the largest share of the advertising time is the green category, in which retailers are responsible for 48% of the advertising time.

Fig. 2 illustrates how the retail sector is a very interesting case from the perspective of sustainability, as its advertising time was so divided. The retail sector allocated 21% of its TV advertising time to green products, but at the same time it also allocated 46% of its advertising time to red products, making it the leader in both categories. When we analysed the advertising times of the most harmful food items by advertiser, we noticed the retail sector's relatively large amount of meat – and especially beef – advertising in contrast to the advertising times from the food manufacturers. Retail advertisers allocated 22 min of advertising time to beef (data not shown). Beef and cheese, which are the most problematic products from an environment perspective, were also emphasized in the restaurant advertising: restaurants allocated 21 min of advertising to these products. On the other hand, restaurants emphasized amber-category foods in their advertising (Table 1).

3.3. The Distribution of Advertising Time Among Different Companies

In addition to the distribution of advertising time among the different actors in the food chain, we were also interested in any concentrations occurring in the advertising from the different companies. It became evident that the advertising was concentrated in the hands of just a few companies (Table 2).

Just five companies accounted for 46% of the total advertising time in the sample. The dairy company Valio was the biggest advertiser. The central role played by Valio in Finnish television food advertising is highlighted also by the finding that, although only foodstuffs were included in the data in this study, advertisements for milk totalled 53 min, and the advertiser in all the milk commercials was Valio. Furthermore, milk had the same amount of advertising time as all food items located in the green area put together (54 min).

The intensity of the concentration varied somewhat among the different advertiser groups. In the case of food manufacturers

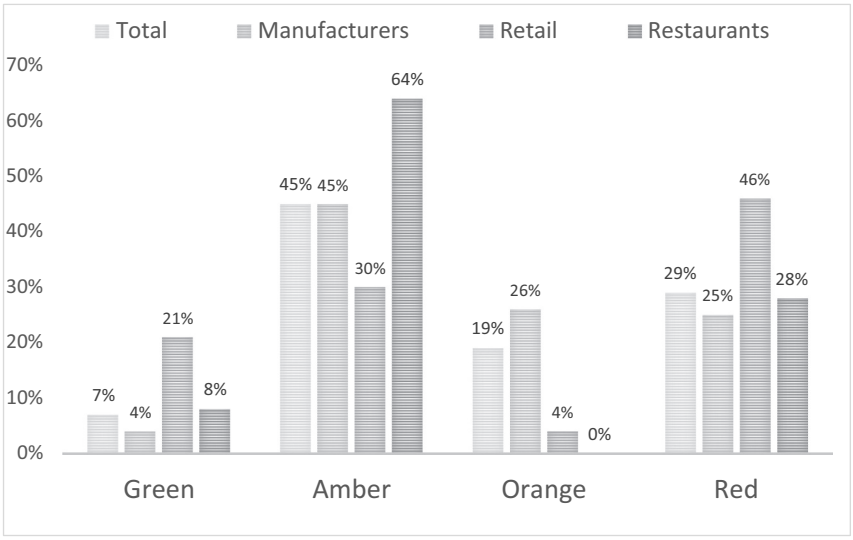


Fig. 2. Advertisement time percentages of different groups in Finnish TV advertising grouped according to nutritional characteristics and climate impact groups.
Green = low-intensity climate impact + positive nutritional characteristics; Amber = moderate-intensity climate impact + neutral nutritional characteristics; Orange = high-intensity climate impact + neutral nutritional characteristics; Red = high-intensity climate impact + negative nutritional characteristics.

Table 2
The five biggest advertisers in Finnish television in terms of advertising time.

Company	Sector	Advertising time min (%)
Valio Oy	Food producer/dairy	119 (16)
K-group Oy	Retailer	96 (13)
McDonald's	Restaurant/takeaway food	45 (6)
Vaasan Oy	Food producer/bakery	45 (6)
Arla Oy	Food producer/dairy	37 (5)
Other advertisers		400 (54)
Total sample		742 (100)

advertising, five companies accounted for more than half (51%) of the total food manufacturers advertising time. Behind one-third of the total advertising time were dairy companies (Valio 23% and Arla 8%). Bakery companies are also major advertisers in Finland. Vaasan Oy (9%) was the second-largest advertiser and the fourth-largest was Oy Karl Fazer Ab (6%), whose main products include sweets and chocolate. In fifth place was Saarioinen Oy (5%), which makes convenience foods and meat products.

As regards the other advertiser groups, the concentration of advertising time was even clearer in the case of the retail sector. No less than 93% of the retail sector's total advertising time was distributed among just three companies, with K-group responsible for 76% of the advertising time, Lidl for 11% and Suomen Lähikauppa Oy for 6%.

The concentration was also very clear in restaurant advertising, with three companies responsible for 91% of the total advertising time. More than half (55%) of takeaway food advertising was for McDonald's, which is the second-largest fast-food chain in Finland, and 25% of the advertising time was advertisements for the largest fast-food chain in Finland, Hesburger. The third-biggest advertiser in the data was the largest pizzeria chain in Finland, Kotipizza. These results suggest that, at least in some respects, television food advertising is somewhat dominated by the largest actors in these sectors.

4. Conclusions and Discussion

The first aim of the current study was to examine which food product categories had the most TV advertising time from the perspective of sustainability. To categorize the advertising times of different food products, we utilized an index that uses the climate impact of food products as the ecological indicator and their nutritional characteristics as the health indicator. Ours was the first study to investigate television food advertising from the perspective of this type of sustainability. The data for this study were gathered from all seasons and all parts of the day to increase their validity.

The major finding to emerge from our analysis was that, from the perspective of sustainability, the distribution of advertising time is far from ideal. The foods with the lowest environmental impact and the highest nutrition density had the least amount of advertising time, and the percentage of advertising time for products with the highest environmental impact and lowest nutritional density was quite significant. However, most advertised were the products located in the middle, between these extremes.

The small percentage of vegetable and fruit advertising is also evident in previous studies. One explanation for this is that, because advertising is dominated by branded products, unbranded products such as vegetables, mushrooms and fruit have tended to be under-represented in advertising (Story and Faulkner, 1990, 739; Byrd-Bredbenner and Grasso, 2000; Dickinson, 2000; Chapman et al., 2006).

The second aim of this study was to investigate the possible differentiation in the advertising times of various actors. The main result from this point of view was that Finnish food advertising is clearly dominated by food producers, who are responsible for 71% of all TV food advertising in our data. This result differs considerably from the television food advertising results found in other countries. For example, in one US study, the five largest advertisers in terms of number of advertisements were all fast-food restaurants (Henderson and Kelly, 2005).

Another interesting finding is that there were some differences between the different food marketers – food manufacturers, retailers and restaurants – in how the advertising was distributed among them seen from a sustainability point of view. This was quite an interesting finding, and it suggests that the possible differences between the various types of advertisers should be given more attention in the future, especially if some practical implications are suggested. In our research data, the food manufacturers undoubtedly have the highest percentage of advertising time. Surprisingly, the third- and fourth-largest food companies in Finland, HKScan Finland Oy and Atria Suomi Oy, who are major meat and meat-product producers, invested a rather small amount in TV advertising.

From the perspective of sustainability, the retail sector was an interesting case because its advertising time was so divided. The retail sector allocated 21% of its TV advertising time to green-category products, but at the same time it also allocated 46% of its advertising time to red-category products, making it the leader in both categories. What is especially thought-provoking is the retail sector's relatively large amount of meat –especially beef – advertising in contrast with the food manufacturers' advertising time. The content of retail sector advertising is also interesting, because in some previous studies this group's

advertising is excluded from the data (Chapman et al., 2006, 174). Additionally, in television food advertising studies, it has been a common practice to exclude advertising for multiple food products (Prell et al., 2011). In our data, multiple food products were especially featured in the retail sector's advertisements. As mentioned earlier, unbranded products such as fruits and vegetables are under-represented in food advertising (Story and Faulkner, 1990, 739; Byrd-Bredbenner and Grasso, 2000; Dickinson, 2000; Chapman et al., 2006). In this context, the retail sector is a key advertiser that advertises also unbranded fruits and vegetables with a high level of nutritional characteristics and a low environmental impact.

Beef and cheese, which are the most problematic products from an environmental perspective, were also well-represented in restaurant advertising. Additionally, also amber-category foods had quite a bit of advertising time. This result can be explained, at least partly, by the fact that the restaurant advertising featured an emphasis on hamburgers, French fries and pizza, and, in these products, potatoes, bread and ingredients such as oil and flour play a central role.

In addition, our results also showed that advertising time on Finnish television advertising was concentrated in the hands of just a few major actors. The food advertising shown on Finnish television is decided upon and planned by a very small number of companies. One influencing factor is probably the fact that advertising on television is more expensive than in other media.

Overall, it can be argued that the structure of Finnish food culture and the Finnish food system is reflected in the data quite significantly. The financial power of certain individual companies and their importance in the Finnish agricultural sector is reflected in the data, where dairy, grain and meat products are prominent. Yoghurt, bread and cheese are the food items that had the most advertising time in the data (Joubert and Poalses, 2012).

These results are interesting when compared to results from studies of television food advertising in other countries. Foods emphasized in the television advertising of many other countries, e.g. fast food and sweet foods such as chocolate and desserts (Cervellon and Dubé, 2000; Henderson and Kelly, 2005; Chapman et al., 2006; Akçil Ok et al., 2015) receive relatively little advertising time on Finnish television.

The findings of this study have a number of practical implications. As our results show, advertising time is not distributed ideally from a sustainability point of view, so there is a definite need for discussion about the role of advertising in sustainable food consumption. This study provides important information that should raise the level of awareness in food advertisers and encourage them to redirect their advertising in a more sustainable direction, as has been called for (van den Bergh, 2011; Brambila-Macias et al., 2011; Vinnari and Vinnari, 2014).

This study showed how especially the retail sector and restaurants have the potential to influence the content of food advertising through their decisions of what products they will advertise. The marketing strategies of retailers and restaurants can have a huge influence in at least two ways. First, these actors have more leeway than individual food manufacturers in choosing the kind of food products they advertise. Especially advertising products that are advantageous from a sustainability point of view – such as fruit, salads and vegetables – would be of great importance. They should also consider advertising less for products such as red meat, processed meat and cheese and shift their advertising more to products such as poultry, fish and vegetable products. Also, in the case of grain products, advertising should focus more on wholemeal products. Second, because a product's price is one of the strongest factors affecting consumer behaviour, especially retail and fast-food companies that provide discount information in their advertising campaigns (Annala, 2018) can have an influence on consumer food-purchasing decisions.

The concentration of advertising time in a few companies can also be seen also as having huge potential from the perspective of sustainability and especially sustainability transition. If the largest companies took into account the sustainability aspect and made changes to their advertising, it would have a great deal of impact on the content of television food advertising.

Part of the discussion about advertising's role in sustainable food consumption is about the need to regulate television advertising and food advertising in general. Advertising can influence consumer behaviour. Television advertising provides information about product attributes and/or increases awareness of the food items (Chandon and Wansink, 2012), and it is, as such, one area that guides consumer decision-making. Typical means of regulation are either self-regulation or governmental regulation. Of course, the implementation of large-scale regulation in food advertising is likely to encounter resistance, especially from the food industry (Caraher et al., 2006), but it might still be easier than imposing limits on personal consumption.

Self-regulation and voluntary codes have been used especially to reduce children's exposure to advertising for unhealthy food items. However, for example Galbraith-Emami and Lobstein (2013) have argued, based on their systematic review, that the effects of these practices have been heterogeneous. Instead, they claim, statutory regulation has more potential to reduce exposure to unhealthy foods advertising. Nevertheless, bans can lead also to unwanted consequences, as firms may lower their prices, which can lead to an increase in demand or result in consumers switching to other unhealthy foods (DuBois and O`Connell, 2018). Nevertheless, there are other forms of regulation. For example, Gsottbauer and van den Bergh (2014) propose that both the carrot (subsidies for beneficial advertising) and the stick (taxation of harmful advertising) could be possible solutions in the case of advertising regulation.

Another possible form of self-regulation is for advertisers who, for example, currently advertise only for products that are in the red and amber categories to switch to advertising in at least equal amounts for products in the green, amber and red categories. For restaurants and the retail sector, this would be relatively easy. Some food manufacturers might have to increase the number of products in their product portfolio if they wanted to advertise on television. In addition to governmentally imposed regulations, this type of system could be implemented voluntarily by companies as part of their corporate responsibility programme.

Besides government regulation and self-regulation, food manufacturers and restaurants could create and advertise more sustainable food items. Offering new foods can be profitable and taking sustainability issues into account can be also good for a company's brand. Although companies want to produce – and advertise – products that consumers want to buy, they can also create new needs (Campbell, 1987). Food as a commodity has some special features, as it is bought almost daily, and it is relatively cheap. In addition, consumers like some changes in their diet and appreciate experiencing new foods (Warde, 1997).

The present study also has some limitations. First, our results are restricted to television advertising and cannot be generalized to apply to all food advertising in other media as well. Second, there are some points concerning the index we utilized, which is based on the nutritional characteristics of the 403 food products most consumed in the Netherlands. It is possible that the food products consumed in Finland are different in their nutritional or environmental characteristics – or both. Therefore, future research should lead to the development of an index based on national data. Additionally, the index we used did not include all the food products advertised on Finnish television: especially various beverages – both alcoholic and non-alcoholic –were excluded from our study. The Dutch index is also somewhat general and does not take account the possible differences there may be between products in a single food group. For example, the types of yoghurt in our sample differed quite significantly in their percentages of fat and sugar.

Notwithstanding these limitations, our study's findings suggest that utilizing the van Dooren et al. sustainability index works in analysing the content of television food advertising, and it can also be used in future research. Further research using this same method to analyse other countries' television food advertising would provide important information about national differences in food advertising. It would be important to explore also the content of food advertising from a

sustainability point of view in other media, e.g. print and social media advertising. The data were gathered in 2012–2013, and it is possible that there have been changes since then in food advertising content. This could be another interesting subject for further research. Additionally, as this study's data were gathered over 24-hour time spans, data from prime time programming would provide information on what kinds of food advertising much of the audience is exposed to. Overall, the sustainability perspective should play a greater role in future research.

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