

Climate mitigating information to consumers by food retailers

- the case of vegetables

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Abstract

Human food consumption contributes to climate change and changing consumption patterns towards a more vegetable-based diet could decrease GHG emissions. However, such change is difficult to achieve due to ingrained habits, cultural and social norms and culinary preferences, highlighting a need to understand consumer behaviour and find efficient strategies for communicating the issue within supermarkets.

To encourage a change to a more vegetable-based diet, product development is necessary for vegetables to be perceived as tasty, convenient and easy to use. However consumers revealed strong negative environmental associations to packaging of potato, which highlights the present challenges for producers wishing to use packaging to communicate positive benefits and thus increase the perceived convenience of such products.

An initial analysis of actual availability of climate-mitigating information on food in supermarkets, showed that it was poorly communicated by retailers. A further investigation on information (climate friendly and organic) and atmospherics (nature sounds) revealed that nature sounds only influenced male participants' willingness to buy (WTB) organic. It also revealed that depending on their connectedness to nature (CtN), information either raised or lowered male participants' WTB organic or climate-friendly products. Finally, tests were performed on an informative tool, the Swedish Meat Guide, which aims to communicate the link between food and climate and to help direct food choice towards less environmentally damaging alternatives, such as vegetables.

The complex concept of climate mitigating information means that the knowledge and understanding, as well as suggested actions, have to be communicated on multiple levels and by multiple stakeholders, taking into consideration the great difference in knowledge levels and motives between consumers. Climate mitigating information needs to be better promoted among food retailers and consumers. Also, other attempts to increase vegetable consumption - product development, nudging, promotional efforts - may indirectly support a climate mitigating food consumption.

Keywords: Horticultural Economics, Labelling, Marketing, Organic, Packaging, Sustainable, Vegetables.

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Dedication

To Gry, Ellen and Vera

När jag blir nyfiken står tiden still. Då blir jag pigg och orkar lite till.

Bob Hund

The constant happiness is curiosity.

Alice Munro

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List of Publications

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

- I Fernqvist, F., Olsson, A. & Spendrup, S. (2015). What's in it for me? Food packaging and consumer responses, a focus group study. *British Food Journal*. 117(3), 1122-1135.
- II Ekelund, L., Hunter, E., Spendrup, S. & Tjärnemo, H. (2014). Communicating GHG mitigating food consumption in-store: An observational study of food retailers in five European countries. *British Food Journal*. 116(10), 1618-1635.
- III Spendrup, S., Hunter, E. & Isgren, E. (2016). Exploring the relationship between nature sounds, connectedness to nature, mood and willingness to buy sustainable food: A retail field experiment. *Appetite* 100, 133-141.
- IV Spendrup, S., Rööös, E. & Schütt, E. (2016). Consumer understanding and use of multi-layered environmental information – findings from focus group interviews on the Swedish meat guide. *Environmental Communications*, under resubmission (March 2016).

Papers I-III are reproduced with the kind permission of the publishers.

The contribution of Sara Spendrup to the papers included in this thesis was as follows:

- I Planned the paper with the co-authors. Carried out the data collection together with Fernqvist. Carried out the literature review, analysed the material and wrote the paper together with the co-authors.
- II Planned the paper with the co-authors. Carried out data collection in cooperation with the co-authors. Analysed the material and wrote the paper together with the co-authors. Corresponding author.
- III Planned the paper with the co-authors. Carried out data collection in cooperation with the co-authors. Analysed the material and wrote the paper together with the co-authors. Corresponding author.
- IV Planned the paper together with Röö. Carried out the data collection together with the co-authors. Performed literature review, the analysis of the material and wrote the paper together with Röö. Corresponding author.

1 Introduction and field of research

1.1 Food consumption and the climate issue

This thesis examines products and activities that are part of most people's daily life; food and, in particular, vegetables, sold and bought within a supermarket. However, added to this is the understanding that greenhouse gas (GHG) emissions negatively contribute to climate change (IPCC, 2007; Karl & Trenberth, 2003) and that different food items represent different amounts of GHG emissions (Godfray *et al.*, 2010; McMichael *et al.*, 2007). Vegetables and meat are two product categories that are very different in terms of GHG emissions, where vegetables represent a low emissions alternative and meat high emissions (Lagerberg Fogelberg, 2013; Foley *et al.*, 2011). A dietary change towards increased consumption of vegetables, at the expense of meat, has been identified as an efficient action in reducing the environmental impacts of agriculture, such as GHG emissions (Foley *et al.*, 2011; Popp *et al.*, 2010) and consequently counteracting climate change (Smith, 2015; Smith & Gregory, 2013; Garnett, 2011). Thus, depending on what foods consumers choose, emissions vary. However, considering the present level of meat consumption and the expected global increase (WHO, 2016), a diet that entails a reduction in meat has not yet been embedded among consumers. Considering the seriousness of climate change, such as negative consequences on future food supply (Costello *et al.*, 2009; Parry *et al.*, 2004) and health (Costello *et al.*, 2009), society and the scientific community urgently require additional knowledge on how to communicate dietary choice information in such a way that consumers care to listen and finally act. This thesis aims to contribute some of the essential information required in this context.

According to UNEP (2016), climate change mitigation can be defined as “efforts to reduce or prevent emission of greenhouse gases”. Examples of such actions span a great range of efforts, covering technical innovations and

changes in consumer behaviour (UNEP, 2016). Garnett (2011) lists GHG reducing actions that consumers can apply in food selection (see Table 1). Of the suggested actions, the two top priorities are to reduce consumption of meat and dairy products and not eat more than necessary, whereas eating seasonal and cooking and storing in energy-saving ways are examples of medium priority actions.

Table 1. *Proposed GHG reducing actions when selecting foods (Garnett, 2011, p.30).*

Priority	Action
High	Eat fewer meat and dairy products
High	Eat no more than needed to maintain a healthy body weight
Medium, possibly high	Do not waste food and manage unavoidable waste properly
Medium	Eat seasonal, robust, field-grown vegetables rather than protected, fragile foods prone to spoilage and requiring heating and lighting in cultivation, refrigeration and rapid modes of transport
Medium	Prepare food for more than one person and for several days
Medium	Accept different notions of quality
Medium	Accept variability of supply
Medium	Consume fewer foods with low nutritional value, <i>e.g.</i> alcohol, tea, coffee, chocolate, bottled water
Medium	Cook and store foods in energy-saving ways; possibly smart metering
Lower	Shop on foot or over the internet

Studies such as that by Garnett (2011) have thus identified practical and effective consumer-friendly advice on how to be a climate mitigating food consumer, but few studies have investigated general consumer awareness of this connection between food and climate, especially as regards the impact of reducing meat consumption (Tobler *et al.*, 2011a). Previous studies have found that consumers lack an understanding of the environmental impact of meat (Lea & Worsley, 2008) and the link between food and GHG emissions (Hartikainen *et al.*, 2014), while they overestimate the environmental impact of packaging (Tobler *et al.*, 2011a; Tobler *et al.*, 2011b; Lea & Worsley, 2008).

1.2 Horticulture and horticultural products

From a climate perspective, it is both relevant and important to study consumption of vegetables, since these products as a group are a climate-friendly choice compared with meat.¹ Based on a culinary and cultural definition, the term vegetable describes edible horticultural products, *e.g.* any

¹The same argument holds for fruit, and the products may have similar use in food

part of a plant that is used as food (Oxford Dictionaries, 2016; Sinha *et al.*, 2010). New potatoes are traditionally defined as a horticultural product (Ekelund Axelson, 1991) and potatoes in general are included in the fruit and vegetable department of supermarkets.

Within Swedish supermarkets, edible horticultural products, characterised by perishability, seasonality and varying availability, were the last food category to be included in the general product range (Ekelund Axelson, 1991). Compared with other categories of groceries fresh fruit and vegetables differ in that many of these products are sold unbranded and to a great extent are treated as commodities (Nijssen & Van Trijp, 1998). Central quality cues such as packaging and branding are thus often absent in this category (Greibitus *et al.*, 2008; Lejdström & Teytaud, 2007), especially as strong brands are generally lacking (Heiman & Goldschmidt, 2004). This lack of information on fruit and vegetables in supermarkets means that these products are often rather anonymous.

As outlined above, replacing less climate mitigating alternatives with vegetables in the diet has the potential to decrease the GHG impact from food. Besides this climate advantage, vegetables are also essential elements for achieving a healthy diet (WHO, 2005) and consuming vegetables has been identified as positive in preventing a wide range of diseases and protecting against several types of cancer and cardiovascular diseases (Hu, 2003; Ness & Powles, 1997; Steinmetz & Potter, 1996). The positive link between vegetables and health has resulted in dietary recommendations, such as recommended minimum intake per day, by national (Livsmedelsverket, 2016) and international bodies (WHO, 2015). Horticultural products are part of the broader concept of horticulture, which Doyle *et al.* (2012) describe as:

Practised from individual level in gardens up to the activities of a multinational corporation [...] incorporating plants for food (fruit, vegetables, mushrooms, culinary herbs) and non-food crops (flowers, trees and shrubs, turf-grass, hops, grapes, medicinal herbs). [...] Horticulturists apply the knowledge, skills and technologies used to grow intensively produced plants for human food and non-food uses and for personal or social needs.

The Chartered Institute of Horticulture - CIH (2016) additionally explains that this work involves plant propagation, cultivation, applying post-harvest technologies and supply chain management, management and marketing of horticultural products to customers and end-consumers. These more recent descriptions are well in line with the overview presented by Tukey (1962), which states that within this field there are those who are concerned with the

science or biology side, those concerned with the business side and those concerned with the home or aesthetics side, who enjoy plants simply for the satisfaction they get from them. Horticulture thus cuts across multiple products, professions and uses, as illustrated in the definition of horticulture, horticulturists and horticultural scientists provided by Dr Owen Doyle:²

Horticulture is the science, technology, art and business of cultivating and using plants to improve human life. Horticulturists and Horticultural Scientists create global solutions for sustainable nutritious food and healthy/restorative and beautiful environments.

1.3 Horticultural science and horticultural economics

The work presented in this thesis lies within the multidisciplinary area of horticultural science, with a specialisation in horticultural economics. Horticultural science has changed over the years. In the mid-20th century the discipline – in Sweden and internationally – was dominated by subjects such as fruit growing, vegetable production, nursery management and others (Ottosson, 1988). Later, the need for bringing in other subjects gradually increased, *e.g.* technology and economics, as done at *e.g.* at the Faculty of Horticulture and Landscape Planning at the Technical University of Hannover, West Germany. Within the subject of horticultural economics in Sweden, it is interesting to note that the first appointment (a lecturer) was related to management.³ Marketing issues have since been included, which reflects the significance of these issues for the development of the horticultural industry (Ekelund Axelson, 1991; Carlsson, 1978; Donelius, 1973). Within the different product-orientated subjects, a subsequent broadening of the subjects has emerged, in Sweden and internationally, and additional subjects have been included. Thus today the following definition, provided by CIH (2016) suggests;

Horticultural science encompasses pure sciences, such as mathematics, physics, chemistry, geology and biology as well as related sciences and technologies that underpin horticulture, such as plant pathology, soil science, entomology, weed science, and many other scientific disciplines. It also includes the social sciences, such as education, commerce, marketing, healthcare and therapies that enhance horticulture's contribution to individuals and society (CIH, 2016).

² Dr Owen Doyle, personal communication, February 12, 2016.

³ Prof. em. Mårten Carlsson, personal communication, March 31, 2016.

The historical explanation internationally for the scope of the subject is that in the beginning of the 20th century (Janick & Goldman, 2003), horticultural science arose through decoupling from more traditional and established sciences, such as biology, and has since operated as an applied science within agricultural universities (Howlett, 1953). Horticultural science may thus be seen as an umbrella under which many scientific disciplines co-exist with a common goal “to build and maintain human knowledge, skills and biological resources in support of the horticulture industry and environment enhancement” (ISHS, 2016). Previous research performed within the field of horticultural science tended to focus on issues connected to the primary producer and issues relating to technical production, such as improving yield and cultivation techniques. Research covering economic aspects was more limited, despite the fact that horticultural science also includes economics and marketing.

The initiative in 1961 to establish the Committee on Horticultural Economics, a subsection in the International Society of Horticultural Sciences (ISHS), marks an important event in the recognition that economic issues were also of great importance for the development of horticultural sciences. Later, in 1962, the Committee became a Commission when the first meeting was held in Brussels (Bennet, 1969), and international meetings have since occurred regularly, with the most recent, the 18th International Symposium on Horticultural Economics and Management in Alnarp, Sweden, in 2015. The definition of horticultural economics was central to establishment of the subject and existing examples provide definitions and descriptions of how to interpret and understand the core of the subject. An initial definition of horticultural economics was provided by Busch,⁴ who stated that the concept of horticultural economics includes two things: horticulture and economics specifically relating to horticulture (Busch, 1967).

Later, Folley (1976) suggested that two aspects of horticultural economics in particular, production economics and marketing economics, can allow knowledge to be advanced and passed on to others along recognised lines, stating that:

It may be said that we are working in the sphere of markets; [...] in the sphere of entire economics, extending to social considerations, [and...] in the sphere of international relations as a whole, extending to politics (Folley, 1976, p.13).

⁴Wilhelm Busch was the first professor of horticultural economics (Gartenbauökonomi). In the early 1970s that chair split into two, with the new one covering horticultural marketing (Gärtnerische Marktlehre).

Fernqvist (2014, p. 11) claimed that horticultural economics can contribute to improving what he refers to as “less graspable dimensions of society and the environment”, which may include changes in consumer behaviour due to social issues and societal values. Fernqvist (2014) also emphasised acknowledging the importance of the consumer and of implementing consumer needs, wants and demands as guiding principles when selecting and developing research projects. Adopting such a research approach can be expected to increase the potential to implement positive intrinsic horticultural characteristics, *e.g.* health and decreased GHG emissions in society.

It is thus clear that research covering economics and marketing has established itself within the horticultural scientific community, much thanks to important work written by key research groups (*e.g.* Alvensleben, 1984; Carlsson 1978; Meulenber, 1978; Sanger 1974, 1969; Donelius 1973;). It should also be emphasised that the presentations given at the Symposium in Alnarp in 2015 represent examples of horticultural economics spanning a great diversity of economics topics, including marketing issues. Horticultural economics has thus expanded from an initial focus on production economics to also include marketing issues and consumer behaviour. This thesis should be viewed in this light.

As previously described, horticultural science is an applied, multidisciplinary subject that arose through separation from science subjects such as biology and botany. This scientific heritage probably explains why horticultural science has in general long been following the same positivistic paradigm from which it originated, and later departed. However, it should be emphasised that this is a subjective reflection, due to a lack of scientific studies on the issue. Nevertheless, considering the central idea in positivism, which is that data on the objective exist and are presented to researchers, who in turn are commissioned to gather and organise the data (Alvesson & Sköldberg, 2009), this perspective emerges strongly in discussions with other horticultural scientists. An additional argument is the strong positivistic emphasis on empiricism that is evident in horticultural science, due to the common assumption that people acquire knowledge through experiences and analysis of data (Sohlberg & Sohlberg, 2008).

Science is an active search for knowledge and, depending on whether the aim is to describe reality or provide explanations, understanding or suggestions, different methodological and theoretical choices have to be made. Science and scientific results are now truly integrated into society and there is increasing demand for science to be useful, in the sense that it should be able to contribute to positive social development (*ibid.*).

1.4 Research positioning

Considering the scientific approach employed in implementation of this thesis work, it could be considered to belong to the positivistic paradigm, with some hints of critical realism, even though the element of critical approach is reduced. Thus it is relevant to argue that horticultural economics to some extent, in addition to the positivistic approach, belongs to the paradigm of critical realism founded by the English philosopher Roy Bhaskar. This paradigm, much like positivism, emphasises the importance of empirical observations, but it also emphasises understanding of unobservable, underlying mechanisms (Alvesson & Sköldberg, 2009). Another important difference between positivism and critical realism is that within critical realism the researcher should not be neutral and objective with regard to the phenomenon under study, which is the case within positivism (Sohlberg & Sohlberg, 2008).

Scientific projects may be tackled from several different scientific perspectives and paradigms, which are often described as dichotomies and opposites; such as the positivistic paradigm versus the constructivistic, or quantitative versus qualitative. The ‘side’ taken by the individual scientist, their epistemological positioning, is often heavily influenced by the scientific subject and/or university, department-related traditions and customs (ibid.). These scientific opposites illustrate different methodological and epistemological considerations, but also barriers between disciplines, and contradictions that have been described as a “science war” (Gould, 2000) in which the two parts either belong to an objective or a subjective research tradition. Barriers are also found between those who emphasize rigour and those who advocate relevance, i.e. contribution to science versus diffusion of knowledge to practitioners (Corley & Gioia, 2011; Gulati, 2007).

Coming from a positivistic research tradition, I can see that this view is implemented within my methodological choices in the present thesis, along with an aim to apply an objective approach in selecting, observing and analysing data. Yet, as this thesis takes a stand in the debate regarding climate change and suggests priority decisions, I am no longer neutral. However, this departure is important in order to increase understanding of the link between food and climate.

1.5 Outline of the thesis

This introductory chapter provides an introduction to the concept of climate mitigating food consumption and to horticulture, horticultural science and horticultural economics. Chapter 2 describes the purpose and framework of the thesis, such as research questions in each paper and limitations. Chapter 3

describes included theories, which form the basis for the final discussion. Chapter 4 presents materials and methods applied, Chapter 5 summarises the results and Chapter 6 presents a final discussion, some conclusions and some suggestions for future research.

2 Purpose and framework

2.1 Aim and research questions

This PhD thesis is based on the combined results from the four different studies reported in Papers I-IV, which were published in the period 2014-2016. The overall aim of this thesis was to:

Problematise and contribute to understanding and use in supermarkets of consumer-orientated information that communicates climate mitigating food consumption, with the focus on vegetables as an example of a preferable alternative.

The work described in Papers I-IV was structured with regard to four individual research questions:

1. The majority of all vegetables is sold in loose form. If they packaged the products, producers could increase durability, raise quality through adding convenience values and increase consumer-orientated information. The question that arises is what climate associations do consumers attach to a climate-friendly product (*e.g.* potato) when packaged compared with sold loose? (I)
2. The concept of GHG mitigating food consumption is less well investigated than other, more well-established sustainability cues such as organic and Fair Trade. The question arising in this instance is how the concept of GHG mitigating food consumption can be communicated in supermarkets. (II)
3. Retailers can communicate directly to consumers and considering the novelty in GHG mitigating food, it is relevant to know if this concept has an effect on consumer willingness to buy (WTB). What theoretical arguments support use by retailers of atmospherics, such as nature sounds, or information signs in order to increase consumer

WTB food communicated as sustainable (organic or climate friendly)?
(III)

4. Climate aspects of food are interlinked with, and may be in conflict with, issues such as biodiversity, chemical pesticides and animal welfare and pasture. The question is how (interested) consumers process and interpret this in relation to different food choices available in supermarkets. (IV)

Within the comprehensive summary provided in this thesis, the research conducted in Papers I-IV is summarised and analysed in order to gain further insights from the combined results.

2.2 Outline of the research

An outline of the research is presented in Figure 1. As can be seen from the diagram, the work was performed within two different projects. The overall aim of the first project, the “Potato Project”⁵ (Paper I), was to explore consumer preferences and to investigate the developmental potential for potato, as an example, especially as regards product development and consumer-orientated marketing. Paper I originated from that project. The knowledge gained on consumer associations between conveniences, such as novel packaging designs and material, was brought to the second project, “Carbon Certified Supermarkets”.⁶ The aim of that project was to explore how retailers, in their unique intermediary role between producers and consumers, can guide consumers’ food choices in a more climate-friendly direction (Ekelund Axelson *et al.*, 2015). Papers II, III and IV originated within this project (Figure 1).

⁵The Potato Project was funded by The Swedish Farmers’ Foundation for Agricultural Research and The Royal Swedish Academy of Agriculture and Forestry.

⁶The Carbon Certified Supermarkets project was funded by the Swedish Research Council Formas and the Swedish Retail and Wholesale Development Council. It should be noted that in this inter-disciplinary project, the climate issue was approached from a life cycle assessment (LCA) and information perspective simultaneously (Ekelund Axelson *et al.*, 2015) which led to the construction of a ‘Meat Guide’ (Röös *et al.*, 2014).

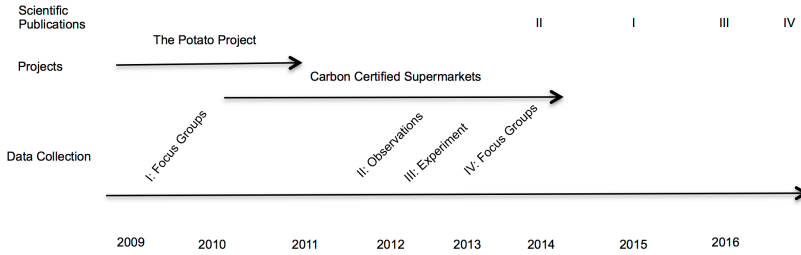


Figure 1. Timeline summarising data collection, project duration and scientific method used in Papers I-IV.

2.3 Summary of research papers

Paper I built on three focus group interviews with consumers in general to explore consumer opinions on packaging of vegetables, through the example of potatoes, and especially what associations consumers attach to packaging material and environmental consequences. This research contributed empirically to an increased understanding of how climate-friendly products, such as potato, are communicated and how and why consumers react to different packaging alternatives.

Paper II comprised an observational study performed in a retail environment in which retail communication regarding the relationship between food and climate was documented, described and analysed. The concept of GHG-mitigating food consumption was operationalised in order to separate the climate effect of food from the more general concept of sustainability, in work to a great extent guided by the arguments provided by Garnett (2011). This research contributed empirical knowledge on how retailers communicate climate mitigating food consumption to consumers.

Paper III was an in-store experiment in which the hypothesised pro-sustainable effect of nature sounds was investigated. The experiment was conducted in the fruit and vegetable department of a supermarket. A pilot-study, based on interviews and free associations, was used to identify consumer and employee associations to the nature sound (birdsong) applied in the experiment. This study represents a first attempt at separating nature sounds from music and investigating the unique effects of nature sounds on consumer willingness to buy (WTB) sustainable food (organic and climate friendly) in a retail setting.

Paper IV focused on whether and how consumers understand and apply multi-layered environmental information using the example of the Swedish Meat Guide, which describes different food items with regard to carbon footprint, biodiversity, chemical pesticide and animal welfare. The study used focus groups of “interested consumers” in which the participants carried out a joint environmental and animal welfare ranking assignment of 17 food alternatives. Participating consumers discussed different environmental issues in connection to food.

To sum up, the starting point for the research was that: In order to decrease the GHG emissions from food, a dietary change is needed. Strategies tested here to achieve this were development of a climate-friendly product (potato) through novel packaging as a carrier of information and way to increase convenience; communication of climate mitigating information by retailers; use of information and atmospherics (nature sound) to influence consumer WTB climate-friendly and organic food; and use of the Swedish Meat Guide to communicate the link between food and climate and steer food choice towards less environmentally damaging alternatives, such as vegetables.

2.4 The use of theories

Within this thesis work, theories were regarded as either complex conceptual structures that provide guidance in highlighting aspects of reality, and thus function as tools for understanding and analysing empirical findings, *e.g.* conceptual frameworks, or as a set of concepts that create a structure in which the concepts are interrelated. In the former case, applied theories were regarded as tools to organise thinking and create a focus for the research, *i.e.* to aid in deciding (describe and define) the part of reality to be investigated. In the latter case, theories were used for building hypotheses and empirically testing formulated theories (hypothetic deductive). In Papers I-IV, theories were applied in two different ways, either as conceptual frameworks when selecting what parts of reality to be investigated (I, II and IV) or as a basis for formulating hypotheses (III). Some of these theories and conceptual frameworks are further described in Chapter 3.

2.5 Scope and limitations

The unit of analysis was either the consumer (Papers I, III and IV) or climate mitigating information and communication efforts by the retailer (Paper II). The connections and differences between Papers I-IV are illustrated in Figure 2

using the model suggested by Grunert and Wills (2007) (to be further explained in section 3.2). The parts of the model investigated in each paper are circled to indicate the scope and limitations of each paper. As can be seen from the diagram, Paper I explores consumer liking and understanding of different packages, Paper II explores external marketing efforts (Exposure), Paper III explores the effect of external influences (Exposure) on perception and the output of decision-making (Use), and Paper IV investigates understanding and inferences of information, and liking and use.

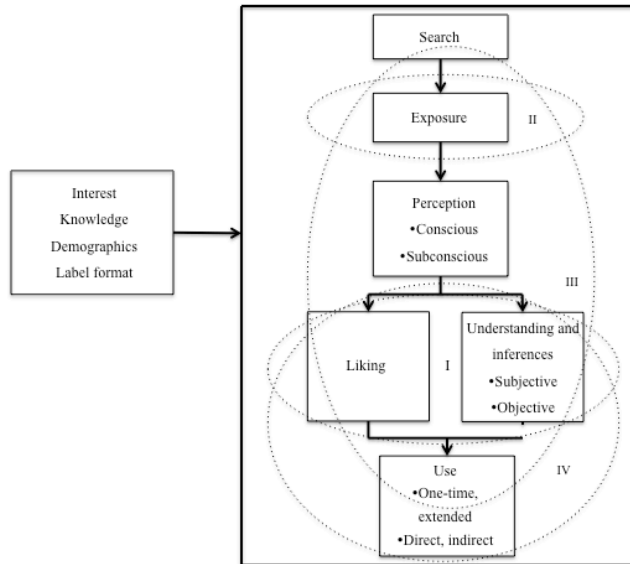


Figure 2. Areas covered by Papers I-IV within the model by Grunert and Wills (2007, p. 387) exploring the consumer effect of information.

The concept of information has been used in a variety of contexts and applications, ranging from daily life to politics and science, which in turn has led to a large amount of definitions (Zins, 2007; Capurro & Hjørland, 2003; Braman, 1989). Within this thesis, lexical definitions of information and of communication were applied. These state that information is “facts provided or learned about something or someone” and communication “the imparting or exchanging of information by speaking, writing, or using some other medium” (Oxford Dictionaries, 2016). The two definitions illustrate that the two concepts are interdependent. Thus when relating these definitions to the concept of climate mitigating food consumption, it could be argued that the facts that form the basis of the concept relate to the information, in the same manner that nutrition labelling is defined as information (Grunert & Wills,

2007), whereas the communication is connected to the actual act of providing this information. It should also be emphasised that this thesis investigates one-way communication (information, symbols and signs received by the consumer) and not two-way communication (communication as a process and a flow of information between consumers and retailers).

The act of shopping and selecting food has been defined as a low involvement and limited problem-solving decision (Solomon *et al.*, 2010), especially in everyday food shopping, where instead of evaluating present alternatives, consumers are influenced to a greater extent by habits (Ouellette & Wood, 1998) and heuristics, such as brand names (Wernerfelt, 1988) and other informative labels (Chen & Chaiken, 1999). This thesis does not compare different labels on products *per se* in the form of logos *etc.*, but considers information in a broader sense.

The decision to limit the study to supermarkets when investigating climate mitigating food consumption was partly because this is where the majority of food is sold in Sweden (SCB, 2012) and in other northern European countries, such as Britain, Denmark, France and Germany (Paper II). Another reason was the advocacy opportunities retailers have in stimulating consumption change, through providing information on the environmental effect of different food products. Within this thesis, retailers are thus regarded as gatekeepers controlling offers to the consumer and what is ultimately sold within the actual supermarket. This assumption is further supported by the UK Sustainable Development Commission (2008), which argues that:

As gatekeepers of the food system, supermarkets are in a powerful position to create, a greener, healthier, fairer food system through their influence on supply chains, consumer behaviour and their own operations (The UK Sustainable Development Commission, 2008, p. 6).

However, it should be emphasised that retailers already take action on matters close to the study area of climate mitigating food. Examples of this can be found in the range of sustainable food in supermarkets (Reisch *et al.*, 2013; Smith & Gregory, 2013), which includes a great variety of products often categorised as “green”, “ethical” or “responsible” (Peattie, 2010), *e.g.* organic and Fair Trade.

The implementation of Corporate Social Responsibility (CSR), *i.e.* how firms contribute to stakeholder society and the relationship between business and society (Carroll, 1999) represents another example of how retailers work with issues connected to the more general concept of sustainability (economic, social and environmental) (Luo & Bhattacharya, 2006; Kates *et al.*, 2005; UN

Documents, 2002). It can be assumed that climate mitigating food consumption provides useful input to a firm's CSR strategy and customer dialogue, but this issue is not further investigated in this thesis.

Needless to say, retailers and consumers are also affected by policy instruments like taxes and regulations, which are outside the scope of this thesis.

2.6 Target audience

The Horticultural Economics research group at the Swedish University of Agricultural Sciences (SLU) has a long tradition of exploring subjects relevant for all parts of the horticultural supply chain and knowledge system,⁷ including the consumer. This thesis is targeted at several of these parts: the research community, the retail industry, the horticultural industry and the interested public.

⁷The horticultural supply chain starts at the grower and ends at the consumer, with intermediates such as packaging and processing, distribution and wholesale/retail (Carlsson, 1995).

3 Theoretical considerations

3.1 Sustainable food consumption

Previous research conducted within sustainable food consumption has extensively examined organic food (Aertsens *et al.*, 2009; Shepherd *et al.*, 2005; Lockie *et al.*, 2004; Magnusson *et al.*, 2003) and ethical food, *e.g.* Fair Trade (De Pelsmacker *et al.*, 2005; Shaw & Clarke, 1999). A characteristic of organic products is that their benefits are often communicated to consumers through the use of labels referring to specific sustainable production methods or a certification organisation, *e.g.* the EU organic label (European Commission, 2016) or KRAV in Sweden (KRAV, 2016). The example of organic food, in comparison with climate mitigating food, is thus structured around implemented regulations and communicated through the use of existing labels and logos, and the concept has reached a high level of consumer recognition and is now regarded as part of the mainstream assortment in small farm shops and large supermarkets (Hughner *et al.*, 2007).

‘Organic’ is thus an example of a credence cue and associated labels depend on the perceived credibility that the consumer associates with the seller (Grunert, 1997), since the veracity of such claims can rarely be verified by the consumer due to technical or practical obstacles (Ford *et al.*, 1988). Credence cues may also comprise labels or other information signalling, *e.g.* nutritional value, food safety, ethics or trust (Fernqvist & Ekelund, 2014). The main consumer arguments for buying organic products are, in order of reported importance: personal health, product ‘quality’ and concerns about degradation of the natural environment (Hughner *et al.*, 2007). These arguments illustrate that egocentric values are stronger motivators for organic food purchase than altruistic values (Aertsens *et al.*, 2009). However, it has also been found that consumers who feel a close connection to nature (Mayer & Frantz, 2004), which can be described as “ecological identity”, “relationship”, “identification”

or “oneness” (Schultz *et al.*, 2004), and thus includes nature within a cognitive representation of self (Schultz, 2002), have a higher tendency to make sustainable choices (Frantz & Mayer, 2014; Schultz, 2002). When exploring and explaining organic food purchasing, previous studies have also identified a difference in attitudes towards organic and actual shopping behaviour, namely the attitude-behaviour gap (Vermeir & Verbeke, 2006), whereby consumers express a positive attitude to organic, but this is not always manifested in actual purchase.

Examples of consumer behaviour that build on the actions listed by Garnett (2011) are recent phenomena such as flexitarianism (Dagevos, 2014) and part-time vegetarianism (Raphaely & Marinova, 2014). Both these are implemented through actions such as deliberate reduction of meat and replacement with increased vegetable consumption and are thus strongly in line with the suggestions provided by Garnett (2011). Advocates of this dietary shift emphasise that such climate mitigating food consumption (in comparison with organic) requires no extra cost, policy requirement or intervention and is thus independent of politicians or decision-makers, which illustrates the flexibility and liberty of action to comply with such a voluntary and independent dietary movement. The underlying motives for flexitarianism have been proven to be connected to concern for the environment (the identified negative climate impact of meat), personal health (the empirically supported identified negative impact of overconsumption of meat on human health) and/or animal welfare (concern about husbandry conditions) (Dagevos, 2014). Closely connected to the concept of climate mitigating food consumption is the additional expression of ‘climate friendly’, which to a great extent represents a synonym to ‘climate mitigating’ (Mäkiniemi & Vainio, 2013).

Adopting climate mitigating food behaviour, or other sustainable food behaviour, can be seen as a change in behaviour and a progress from conventional food to a new alternative. The transtheoretical model (TTM), comprises six stages which describe adaption of ‘new’ behaviour as: precontemplation (no intention to change behaviour), contemplation (awareness of the problem, but still no commitment to action), preparation (intending to take action within a month and perhaps performing small behavioural changes), action (behaviour is changed), maintenance and finally termination (Norcross *et al.*, 2011; Prochaska & Velicer, 1997). This model was originally intended to explain health behaviour changes, but it has also been used to describe adoption of more sustainable food behaviour (Tobler *et al.*, 2011a). The TTM does not predict that people proceed through these stages linearly, as they may relapse and return to an earlier stage. Changing behaviour, such as adopting more sustainable food choices, often means that

consumers have to make changes regarding habits and lifestyle, so the expected benefits, such as health, taste (seasonal, local) or the environment, are crucial in making these changes worth the effort.

3.2 Communicating food information to consumers

In order to explore the effects of information on food, illustrated by nutrient information, Grunert & Wills (2007) developed a model (see Figure 2) which combines consumer decision making and attitude formation and change. The model was developed through input from models of consumer decision-making (Engel *et al.*, 1968) and hierarchy effects models of communication effects (Robert & Steiner, 1961). The Grunert and Wills model thus merges consumer decision making, *i.e.* the internal consumer processes affecting consumer choice and how different inputs (*e.g.* information) may affect the actual choice made (Solomon *et al.*, 2010; Bettman *et al.*, 1991), with attitude formation and change, *i.e.* how consumers process information, understand it and evaluate it in regard to personal relevance (Eagly & Chaiken, 1993; Petty *et al.*, 1981).

The rationale behind the model is that in order for labels to be efficient, consumers need to be exposed to information. The effect of information is enhanced if consumers actively search for the information, yet this is not necessary since perception may be conscious or subconscious. Perception in turn links to understanding and inferences, which relate to the meaning of the information. This in turn may be either subjective (the consumers' perceived meaning) or objective (the senders' intended meaning with the information). Consumer liking, due to *e.g.* usefulness or preferred colours or signs, may also have an effect. Use, finally, relates to whether the information is actually used in making a choice. The information may have a direct effect, but it may also have an indirect effect, similarly to a learning process, and thus aid in fostering an understanding of the information. Factors such as interest, knowledge, consumer demographics and label format are also important to consider, since these may have a great influence on search, perception, understanding and use.

Retailers have made attempts to communicate GHG mitigating food consumption, such as reporting the carbon footprint of individual products (a calculation of the GHG emissions for a specific product). Tesco, a leading British retail chain, introduced a Carbon Footprint labelling campaign showing details of GHG emissions from each product and also a category average figure allowing consumers to make informed choices (Park, 2009). However, the initiative was abandoned in early 2012 for being too costly, difficult to manage and difficult for consumers to understand (Guardian, 2012). A different

Swedish approach (“The Easy Way”)⁸ designed to communicate category-level information and consumer-orientated advice on food choices from a sustainable and climate mitigating perspective was introduced by the Swedish retail chain Willy:s. One example of communication was “Potatoes are climate smart food that grow directly on fields without the need for fossil fuelled greenhouses. [...]” (Axfood, 2012). However, that scheme was closed in early 2012.

When discussing what retailers can or should do in relation to climate mitigating food, “nudge theory” or “nudging” has emerged as a suggested strategy. This term is defined by Thaler and Sunstein (2008, p. 6) as designs “that alter people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives”. Nudge thus builds on the idea that positive reinforcement can have a positive impact on decision making and may even be more efficient than *e.g.* instructions, legislation and enforcement (Hastings *et al.*, 2009).

3.3 The role of packaging

Product packaging is often used to communicate information, such as brand or label, but packaging carries additional functions in both the logistics and marketing chains (Prendergast & Pitt, 1996), acting as an interface between the product and the logistics system, and between the consumer and the product (Olsson & Larsson, 2009). The functions of packaging are often connected with the physical properties of the product, such as protecting and preserving it, but also promote hygiene and safety and facilitate distribution. Packaging is also an important tool in marketing a product, since it enables communication of messages to consumers, such as information and instructions and filling a need for convenience (Rundh, 2005).

Informative elements influence consumer choice at the place of purchase (Silayoi & Speece, 2007; Silayoi & Speece, 2004) and such features of packaging are thus important in gaining a competitive advantage (Nancarrow *et al.*, 1998). Examples of such informative elements are different kinds of images, including *e.g.* a logo, print fonts and illustrations (Rundh, 2009; Silayoi & Speece, 2004; Underwood *et al.*, 2001; Polonsky *et al.*, 1998; Underwood & Ozanne, 1998), brand (Wells *et al.*, 2007; Underwood, 2003; Pieters & Warlop, 1999) and other extrinsic cues associated with the actual products (Fernqvist, 2014), such as colour and novelty design (Underwood *et al.*, 2001; Burke & Jones, 2000; Schoormans & Robben, 1997).

8. *Enkla vägen*, in Swedish.

3.4 Atmospherics and congruency

Atmospherics explain how the physical environment in *e.g.* a supermarket can influence consumer behaviour (Kotler, 1973). Atmospherics comprise planned physical changes, in *e.g.* music and light (Figure 3), which are expected to create specific emotional effects and subsequently increase the probability of purchase, the actual customer purchase behaviour (Gilbert, 2003; Kotler, 1973).

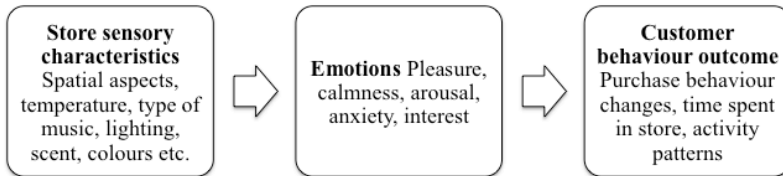


Figure 3. Schematic description of the concept of atmospherics (Gilbert, 2003).

Closely connected to atmospherics is the concept of congruency, which addresses the power of connecting the right sound to the right product, and thus being able to control selection of product through adding sound. In order to evoke such perceived congruency, the sound has to be perceived as carrying relevant “rationale or symbolic information”, which “is connected with the product being sold” (Jacob *et al.*, 2009, p. 75).

Empirical studies examining the effect of congruency on customer purchasing behaviour include that by North *et al.* (1999), which examined and identified congruency between music and wine from the same country of origin, *e.g.* German music increased the sales of German wine. Other examples are provided by Areni and Kim (1993), who found that classical music increased sales of more expensive wines, and Jacob *et al.* (2009), who discovered a link between romantic music and increased sales in a flower shop.

3.5 Other frameworks

A starting point for the present research was the framework by Garnett (2011) as shown in Table 1. In the inter-disciplinary project “Carbon Certified Supermarkets”, the climate issue was approached from a life cycle assessment (LCA) and information perspective (Ekelund Axelson *et al.*, 2015), which led to construction of the Swedish Meat Guide (Röös *et al.*, 2014). Together with the above frameworks these constitute the basis for the discussion of results and conclusions presented in Chapter 6.

4 Materials and methods

4.1 Observations

During the initial start-up phase of the project “Carbon Certified Supermarkets”, it became clear that there was a lack of scientific articles explicitly examining how retailers, within their supermarkets, inform about or communicate the climate impact of food. This identified lack was regarded as a consequence of the novelty of the concept of climate mitigating food and highlighted the relevance of examining whether and how such information is present and communicated within supermarkets. Since observation is a proven method when aiming to systematically explore a new subject, in this case climate mitigating food, this methodological approach was chosen for Paper II. Application of this method was expected to provide a good starting point for future studies within the project and provide guidance on variables that may be relevant for future studies (Kruuse, 1988).

Paper II was based on in-store observations in 30 different grocery stores spanning five European countries; Britain, Denmark, France, Germany and Sweden. The food retail chains investigated represent dominant actors on each market. The aim of the observations was partly to identify variation, but mainly to observe how consumers were exposed to climate mitigating food consumption information within the supermarkets. The first observations were conducted in Sweden and during these, the stores were visited by three of the authors at the same time. This was done to reduce observation bias, synchronise the observation approach and provide a common baseline from which to make subsequent observations in other countries, which due to time and cost limitations were performed by individual researchers. The actual observations sought to identify any visible signs of climate mitigating communication messages. By actively searching for information, the

expectation was that not only well-communicated information, but also less visible or implicit information, would be found.

The observations covered each store entirely, including entrances, and lasted between 40 minutes and 1.5 hours. The list of reducing actions in Table 1 was used as assistance in identifying examples of climate mitigating information, which were manually recorded in a semi-structured survey.

The observations included a general walkthrough of the supermarket and observations of specific product categories, namely fresh beef, pork, chicken, fruit, vegetables and potatoes and vegetarian meat alternatives (such as frozen vegetarian meals, canned beans and other pulses). For each product category, the search covered any climate communications found in adjacent printed materials (*e.g.* on banners or poster), on shelves or shelf edges or in multimedia devices, see Appendix 2.

During the general walk-through, any climate mitigating information given by the retailer at any place within the store was recorded. This included *e.g.* in-store printed information such as brochures, pamphlets, company magazines and leaflets. Since the aim of the study was to observe retailer communication within store, information communicated by producers or other actors was not recorded. Moreover, store websites and sustainability reports were not included.

4.2 Focus groups

Focus groups are group discussions usually comprising 4-6 people in which the topic(s) discussed may be largely governed by the researcher, often using a semi-structured interview guide (Wibeck, 2010). This method thus enables the researcher to structure and focus the discussion to cover specific themes or topics and explore these in depth (Bryman, 2012). The focus group method has been frequently used in marketing research aiming to gather information about consumer behaviour (Jenkins & Harrison, 1990). Another characteristic of the focus group method is that it has been demonstrated to be appropriate when the aim is to reveal respondents' attitudes, beliefs, experiences and reactions. The built-in interactions and the social setting that characterise the method are believed to allow a diversity of views to emerge (Gibbs, 1997), and an individual respondent's statements may bring issues to mind in another respondent (Lawless & Heymann, 2010). Considering that the method has proven to be a suitable approach for exploring food attitudes (Barrios *et al.*, 2008) and complex behaviour, such as food consumption (Morgan & Krueger, 1993), it was selected for use in Papers I and IV, both of which touch upon understanding consumer food attitudes. Such qualitative studies can provide

data in unexplored fields, thereby providing insights and concepts for further research using a quantitative approach, such as questionnaires.

The empirical results in Paper I were obtained in three focus groups, with six participants in each. The respondents were recruited as a convenience sample, with the first group consisting of administrative personnel on the university campus, and the other two through contacts made with help from colleagues and previously recruited participants. The discussions were held in 2009 in the Malmö region of southern Sweden. The respondents were told in advance that the topic of the discussions would be food consumption habits with respect to potatoes.

The aim of Paper I was to investigate consumer attitudes and associations with different packaging alternatives. The participants were asked to write down their immediate spontaneous response to the different packages (*e.g.* different sized plastic bags, paper bags with plastic windows) in a simple questionnaire before the discussion started. The purpose of providing the participants with an opportunity to familiarise themselves with the material was to stimulate good discussions and to collect individual arguments before the participants were influenced during the discussions. The interviews were carried out using a semi-structured interview guide, see Appendix 1, which was built around topics that were included based on theoretical considerations (Rundh, 2005). However, despite the fact that certain subjects were determined in advance, the guide allowed new, unforeseen topics to emerge. Two of the authors (Fernqvist and I), were present during all interviews, one leading the discussion while the other took notes. The interviews lasted 1-1.5 hours and were audio-recorded and transcribed.

The transcribed material and the completed questionnaire were analysed by applying thematic analysis (Knight *et al.*, 2007; Boyatzis, 1998). The initial themes for coding were identified based on the aspects of packaging listed by Rundh (2005). In the first step of the process, all transcribed material and questionnaire responses were reviewed and statements associated with one or more of the 10 themes were coded accordingly. In the second step, the coded material was further scrutinised, which yielded a number of sub-themes relating to the initial themes. Some of the coded statements were also re-coded to other themes if the in-depth analysis showed this to be more appropriate. The process was repeated until saturation.

Focus groups were also used in Paper IV, which aimed to investigate consumer understanding of a multi-layered tool, using the Swedish Meat guide as an example (see Figure 4).

The Meat Guide

















	Carbon footprint	Biodiversity	Chemical pesticides	Animal welfare and pasture
BEEF MEAT				
Swedish org pasture-based meat 	🔴	🟢	🟢	🟢
Swedish pasture-based meat 	🔴	🟢	🟡	🟢
Organic beef meat, KRAV 	🔴	🟡	🟢	🟢
Swedish organic beef meat, EU org 	🔴	🟡	🟢	🟡
Imported organic beef meat, EU org 	🔴	🟡	🟢	🔴
PORK MEAT				
Organic pork meat, KRAV 	🟡	🟡	🟢	🟢
Organic pork meat, EU org 	🟡	🟡	🟢	🟡
Swedish Seal climate certified pork 	🟡	🔴 +	🔴	🟡
Swedish Seal labelled pork 	🟡	🔴	🔴	🟡
Swedish anonymous* pork 	🟡	🔴	🔴	🟡
Danish and German anonymous* pork	🟡 !	🔴	🔴	🔴
+ The amount of soy regulated in the climate certification ! High risk of eutrophication due to many animals per area				
CHICKEN AND EGG				
Organic chicken and egg, KRAV 	🟢	🟡	🟢	🟢
Organic chicken and egg, EU org 	🟢	🟡	🟢	🟡
Swedish Seal climate certified chicken 	🟢	🔴 +	🔴	🟡
Swedish chicken meat  	🟢	🔴	🔴	🟡
Imported anonymous* chicken meat	🟢	🔴	🔴	🔴
Swedish eggs	🟢	🟡	🟡	🟡
Finnish eggs	🟢	?	?	🟡
Danish eggs	🟢	?	?	🔴
+ The amount of soy regulated in the climate certification				
ALTERNATIVES TO MEAT FROM AGRICULTURE				
Organic legumes 	🟢	🟢	🟢	---
Legumes	🟢	🟢	🟡	---

Figure 4. Section of The Swedish Meat Guide (Röös *et. al.* 2014, p.160).

The analysis was based on three key questions; (1) Does the consumer target group for the Swedish Meat Guide (the “interested consumer”) interpret and understand the information it provides as intended, *i.e.* is it targeted at the audience and given in a clear and salient way? (2) What kind of discussion and reflection, *e.g.* social values, on meat consumption does using the Swedish Meat Guide stimulate? and (3) What choices does the Swedish Meat Guide (theoretically) stimulate and is it useful to the target audience in making such decisions? Before the main interviews, a pilot interview on a group of students at SLU-Alnarp was performed to test the outcome of the ranking assignment.

The data collection was performed during autumn 2013, and consisted of five focus groups (not counting the pilot interview), with 3-5 participants in each. The interviews were recorded and transcribed.

One requirement during construction of the Swedish Meat Guide was to target a specific consumer group, defined as “interested consumers”. These are consumers who feel personal responsibility to act on climate change and accordingly are willing to change their behaviour, but find it complicated to do so, and who are expected to have above average knowledge of the environmental impact of food (Röös *et al.*, 2014). Thus participants chosen for Paper IV had to fit this profile. It was assumed that university students choosing a science degree focusing on sustainability issues and active members of an NGO would be a good fit as “interested consumers”. Furthermore, the participants had to express an interest in food, consume meat at least occasionally and buy most of their food in regular supermarkets. Consequently, relevant consumer groups were identified as students from the Swedish University of Agricultural Sciences studying for a degree in energy systems, and also active members and employees of the Swedish Society for Nature Conservation (SSNC), Sweden’s largest environmental NGO.

To ensure that the focus group interviews provided insights into the actual usability of the Swedish Meat Guide, the interviews included a forced joint ranking assignment, see Appendix 4. This method has been proven to be fruitful in uncovering *e.g.* misunderstandings, preconceptions and values (Morgan *et al.*, 2001) and in stimulating discussions that may reveal whether the subject (in this case the design of the guide) is structured in such a way that supports its objectives. The ranking assignment was thus regarded as a relevant tool in determining how the participants used and interpreted the guide, and in eliciting opinions, ethical standpoints and ranking strategies.

The group assignment was to rank 17 food alternatives, including legumes, from best to worst, based on the information presented in the Swedish Meat Guide (see Figure 4). After the assignment had been explained to participants, they were each provided with a copy of the guide and given a few minutes to familiarise themselves with it. To minimise the impact of the moderator, the assignment was explained without specific instructions, following previous suggestions (de Bruin & Bostrom, 2013). Each interview lasted 50-70 minutes and all interviews were guided by the same moderator (myself), assisted by either Röös or Schütt. Intervention in the discussions by the moderator and assistants was minimal.

To answer the three key questions, data coding was performed through theoretical thematic analysis, an approach based on a specific theory or explicit area of interest (Braun & Clarke, 2006). To answer key questions (1) about

understanding the guide, the material was analysed (comparing the expressed understanding with the intended information) to determine whether the participants understood the four indicators (Carbon footprint, Biodiversity, Use of pesticides and Animal welfare and pasture) and the traffic light system (see Figure 4). To answer key question (2), *i.e.* to identify discussion and reflection on *e.g.* social values on meat consumption, the material was analysed using thematic analysis, a method for identifying, analysing and reporting patterns (themes) within data (Braun & Clarke, 2006; Boyatzis, 1998). The analysis was performed according to the guidelines presented in Braun & Clarke (2006). The evaluators (Röös and I) first familiarised ourselves with the material through listening to and reading the transcripts. Initial codes were then generated and from these themes were identified. We did this and then compared the individual results through reviewing, refining and naming the themes. To answer key question (3), the actual outcome of the ranking assignment (*i.e.* how different meats and meat alternatives were ranked), the material was analysed in terms of identified strategies used for weighting the four different indicators.

4.3 Experiment

This in-store experiment was set up with the aim of testing four different hypotheses (H1-H4); the positive effect of nature sounds (bird song) on willingness to buy (WTB) sustainable food (organic or climate friendly) (H1); the positive effect of nature sounds on connectedness to nature (CtN) (H2) and on mood (H3); and the moderating effect of sustainable information on the relationship between CtN and WTB (H4).

The experiment was conducted in a Swedish supermarket in the city of Lund over the course of 12 days. Each participant was exposed to one of six treatments (see Table 2). The average gender distribution within the groups was 42% male and 58 % female. In order to minimise the effect of time and day, all treatments were applied twice on a weekend (Fri-Sun) and weekday (Mon-Thurs), and from morning to evening on each day. The experiment was performed within the supermarket's fruit and vegetable department.

The information applied consisted of three different cues; no information (the control), organic or climate friendly. The information on the sign was created using the same theme, font and size as used by the retailer and the three different messages were: a) Control: Eat more carrots!, b) Organic: Eat more organic carrots! and c) Climate friendly: Eat more climate friendly carrots! See Figure 5 for illustration.

Table 2. Treatment groups, day of week and participants in the experiment described in Paper III, p.136.

Group.	Treatment ^a	Day of week:	Total no. of participants	Response rate (%)
		no. of questionnaires collected		
1	C	Thursday: 40 Saturday: 70	110	47
2	C+ NS	Monday: 49 Friday: 57	106	40
3	O	Tuesday: 65 Friday: 41	106	57
4	O + NS	Tuesday: 37 Sunday: 64	101	38
5	CF	Monday: 51 Sunday: 38	89	45
6	CF + NS	Wednesday: 53 Saturday: 62	115	51

^a C = Control, O = Organic, CF = Climate friendly, NS = Nature sound

The information was thus connected to carrots, which were placed in a large wooden barrel (identical to those used in other parts of the store).



Figure 5. Barrel of carrots, and an example of the sign used in the experiments in Paper III.

In order to control for the impact of brands, labels and other packaging information, the carrots were displayed loose (Figure 5). By holding these variables constant in each treatment, the potential for confounding effects was expected to be eliminated, following the same logic as presented above regarding time of day and week day. Carrots were chosen since they fitted all three information types studied in the experiment: a conventional staple product, a common organic product and a relevant and credible climate-friendly product due to the low carbon footprint (Garnett, 2011). It is also difficult to distinguish visually organic carrots from conventional (Tobin *et al.*, 2013), which enabled the same type of carrot (organic) to be used for all treatments and thus control for possible quality differences between organic and conventional. The price was held constant, at 1.5 euro/kg.

The sound (birdsong) was communicated through the store's own sound system, in combination with a portable sound system, placed close to the barrel, where the actual experiment was conducted. The applied sound was implemented as part of the store's atmospheric design. During the experiment, the nature sound was either 'on' or 'off' depending on treatment (see Table 2). In order to ensure that potential experiment participants had been exposed to the nature sound, only those leaving the FVD through a specific aisle were asked to participate in the experiment.

Consumers were asked if they wanted to participate, and if they accepted they were told to look at the sign and fill in a self-administered questionnaire, see Appendix 3. The questions included covered WTB, CtN, mood, gender and age. The questions asked to measure WTB, CtN and mood are reported in Table 3.

In addition to the main experiment, a pilot-study was performed to ensure that the sound used to illustrate nature sounds, the song of the pied flycatcher (*Ficedula hypoleuca*), really did evoke associations to nature. This pilot-study was conducted in the same supermarket as the main study and consisted of interviews with six customers and two employees using the method of free association (Roininen *et al.*, 2006; Rozin *et al.*, 2002). Analysis of the data by thematic analysis (Boyatzis, 1998) revealed that the sound mainly gave rise to positive/neutral nature associations, such as thoughts about forests, spring and nature. However, some customers also expressed negative associations with the birdsong, such as aversion to birds in general and bird droppings, as well as a feeling of being manipulated by the retailer through the use of added artificial sounds. To sum up, the outcome of the pilot-study indicated that the nature sound chosen was relevant to use in the experiment.

Table 3. Scales and questions included in the questionnaire in Paper III

Variable	Scale and questions	Cronbach's alpha	Reference
Willingness to buy (WTB)	7-point Likert scale ranging from 1 (very low/do not agree at all) to 7 (very high/agree completely)	($\alpha=0,84$)	(Dodds <i>et al.</i> , 1991)
	1. The probability that I would consider buying carrots like these today is:		
	2. The probability that I will buy carrots like these today is:		
	3. My willingness to buy carrots like these today is:		
	4. If I were going to buy carrots today, I would consider buying carrots like these:		
	5. At the price shown, I would consider buying carrots like these today:		
	Scale and questions	Cronbach's alpha	Reference
Connectedness to nature (CtN)	7-point Likert scale ranging from 1 (do not agree at all) to 7 (agree completely)	($\alpha=0,80$)	(Mayer <i>et al.</i> , 2009)
	1. Right now I feel that I am a part of nature.		
	2. At this moment I feel no kinship with plants, animal life or anything else in nature.		
	3. Right now I feel a sense of oneness with the natural world around me.		
	4. Right now I am deeply aware of how my actions affect the natural world.		
	5. At the present moment I don't feel connected to nature.		
	6. At the moment, I feel that the natural world is a community to which I belong.		
	7. I currently recognise and appreciate the intelligence of other living organisms.		
	Scale and questions	Cronbach's alpha	Reference
Mood	7-point Likert scale ranging from 1 (do not agree at all) to 7 (agree completely)	($\alpha=0,76$)	(Peterson & Sauber, 1983)
	1. I am currently in a good mood.		
	2. As I answer these questions I feel cheerful.		
	3. For some reason I am not very comfortable right now.		
	4. At the moment I feel edgy or irritable.		

5 Results

This results chapter presents the main findings from each paper. For a complete description of the results see the original papers, which are attached at the end of the thesis.

5.1 Paper I

Information on packaging is one way of informing consumers about environmental issues like climate effects and can contribute to increased sales of a climate-friendly product like potato. The thematic analysis performed in Paper I resulted in nine themes related to specific packaging features: (1) packaging material; (2) pack size; (3) protection and preservation; (4) convenience; (5) price; (6) communication and information; (7) ethical perspectives, (8) novelty and (9) consumer purchases of the unpackaged, undifferentiated product in relation to the packaged version. The most discussed themes were (1) and (6), *i.e.* aspects of packaging material and information.

Regarding packaging material, paper bags were mentioned as being ‘homely’, ‘nice’ and giving a ‘feeling of healthiness’, but also as being a bit ‘dull’. The use of a transparent window on the back of paper bags was appreciated. Plastic packaging, on the other hand, was regarded more negatively, *e.g.* as unnecessary, resulting in lower quality (condensation and greening of the potatoes) and ‘strange’. Overall, plastic bags were also seen as ‘bad for the environment’, revealing strong concern in that regard. The novelty feature of being able to cook the potato directly in the microwave oven was regarded with much scepticism, as being ‘unappetising’ and ‘suspicious’ and ‘not environmentally friendly’.

The issue of price did not evoke many comments. The use of packaging was seen as an additional ‘cost’, especially if plastic, and bulk potatoes were

regarded as being the cheapest. Potato was generally perceived as an inexpensive product.

The use of labels and information signalling organic or local produce (grower's name) was seen as an advantage and the organic label was well known and had a strong signalling value. Nevertheless, the use of many labels was seen as an overload of information. An applied health label was not discussed at all and hardly noticed. Information regarding durability, or shelf-life of the product, was generally seen as unnecessary. Recipes and cooking instructions were appreciated.

Ethical and environmental perspectives were raised in connection with the different packages used and covered discussions on differences between material, with paper preferred over plastic. Table 4 summarises the reported positive and negative aspects of packaged and unpackaged commodity.

Table 4. *Summary of packaging aspects working in a positive (+) or negative (-) direction in consumer choice relative to the unpackaged commodity (Fernqvist et al., 2015), p. 1130*

Packaging	Unpackaged commodity
Much information available (+)	Lack of information (-)
Brands, labels and certifications (+)	No brands, labels or certifications (-)
Organic produce available (+)	No organic produce available (-)
Many speciality varieties (+)	No speciality varieties available (-)
	You have to use an anonymous plastic bag for picking, instead of a paper bag (-)
The package sizes are predetermined (-)	You can buy the amount you want (+)
The price is high (-)	The price is low (+)
You cannot select individual potatoes (-)	You can select the potatoes you want (+)
You cannot remove low quality potatoes (-)	You can remove low quality potatoes (+)
Plastic packaging material (-)	The smell of soil, and the feeling of touch (+)
	Feeling of 'farmers' market' (+)

5.2 Paper II

Analysis of the observations in supermarkets resulted in a model illustrating GHG mitigating food consumption as consumer choice in the actual purchase moment and operationalisation of the concept of GHG mitigating food consumption. The model (Figure 6), which is largely based on the suggestions provided by Garnett (2011), illustrates GHG mitigating food consumption separated into four dimensions, ranging from low to high GHG impact. The first (the black horizontal line) relates to the food choice itself (from vegetables

to meat), the second (green) shows actions and choices consumers can make regarding food conventions (e.g. would they be willing to eat vegetables only when in season). The third (red) considers processes that can be made shortly before, during and after food is consumed (e.g. whether to walk or drive to the store), and the fourth (blue) comprises choices relating to different production systems (e.g. to buy organic or not). The question marks added to organic, local and seasonal in Figure 6 signal the present debate concerning the environmental impact of such production schemes. These are included since retailers often use such labels and information as consumer-orientated guiding principles for sustainable food.

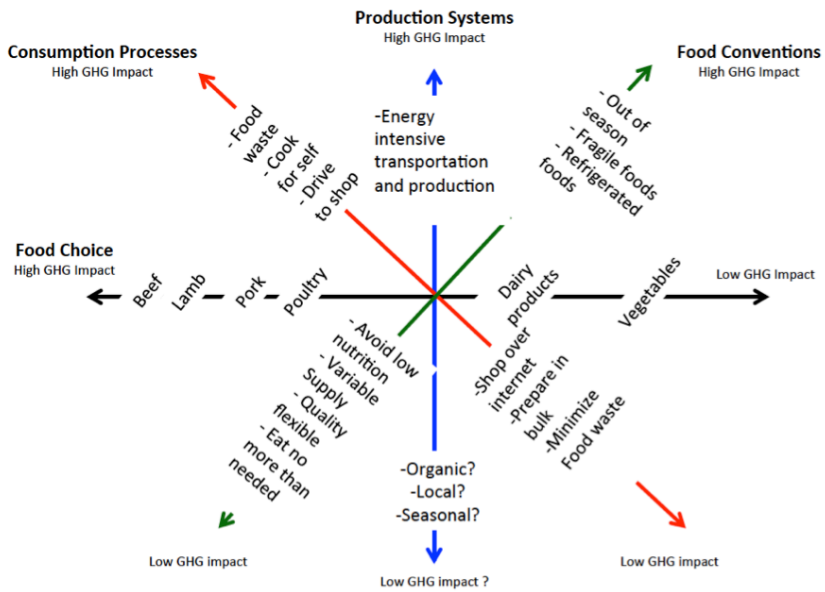


Figure 6. Normative choices in climate mitigating food consumption (Paper II, p. 1621).

Building on all the actions in Figure 6, climate mitigating food consumption was operationalised as:

deliberate and informed actions taken by consumers in their food choices, conventions, consumption processes and selection of foods produced using methods that reduce GHG emission relative to alternative choices (Paper II, p. 1622).

The fact that making a climate mitigating food choice can be separated on four different axes highlights the diversity in how the concept can be applied. Defining such complexity is challenging and the model suggested is thus to be regarded as a guiding tool in sorting out and emphasising the multitude of consumer actions that may represent a climate mitigating food choice.

The in-store observations were divisible into three kinds of communication: ‘Direct’ climate mitigating communications, *i.e.* actions that distinctly address the link between food and climate; ‘Indirect’ climate mitigating communications, such as seasonal and efforts to reduce food waste, which may indirectly lead to a mitigating food choice; and ‘Ambiguous’ GHG mitigating communications, including *e.g.* organic. From a climate mitigating perspective, when organic is used in order to signal climate friendliness, the link between food and climate is not as clear, mainly since the organic concept covers a wider spectrum of environmental issues than climate mitigating food consumption.

The observations revealed few examples of indirect and even fewer of direct climate mitigating information.

Messages promoting ‘*eat seasonal*’ were found, but none of these was directly linked to climate issues, although the example of the ‘Eat seasonal’ logo present in some British supermarkets touched upon the issue through its emphasis on “better taste, better value and better for the planet”. Seasonality was not commonly communicated at the UK stores and, when it was found, the products were all domestic, if not local. The observations revealed differences in the use of the term seasonal. In the British case where ‘seasonal’ was mentioned, it was equated with local and domestic, whereas observations in Sweden revealed that retailers motivated consumers to eat seasonal due to better taste. A Swedish example also illustrated the retailer argument to buy seasonal due to lower prices, communicated through a “seasonal wheel” that showed which foods were in season in any given month, from a global and domestic perspective. Interestingly, and unlike the British examples of seasonal foods, this retailer did not limit seasonal to domestic products. Foods from around the world were showcased, with the heading “it is always harvest time somewhere on earth” (ICA, 2012). To summarise, seasonal was communicated through indirect arguments such as taste, quality, freshness and value.

Price-reduced, short-dated foods were identified examples of actions relating to reduction of food waste, but were not communicated by relating to the climate issue.

Various ambiguous climate mitigating messages were found, *e.g.* organic and additional labels such as the Danish label “Concern”,⁹ which was applied

⁹*Omtanke*, in Danish.

as an umbrella for products that are “healthy, organic or sustainable alternatives” in order to communicate products connected to various topics such as organic/the environment, health, climate and ethics. Health information, such as five-a-day (promoting suggested daily intake of fruit and vegetables) was present, but these messages were not linked to climate mitigating food consumption.

5.3 Paper III

This in-store experiment investigated whether the nature sound affected connectedness to nature (CtN), mood and willingness to buy (WTB) food communicated as being sustainable (organic or climate-friendly), and examined the moderating effect of sustainable information on CtN and WTB. Due to identified gender differences between men and women in WTB towards the organic and climate friendly information as well as in expressed connectedness to nature, the possible effect of gender was investigated in H1, H2 and H4.

To test hypotheses H1-H3, an independent samples t-test was applied, while to test H4 one-way ANOVA and linear regression were applied. All calculations were performed in SPSS (IBM, 2013).

The results for H1, investigating the positive effect of nature sound (bird song) on willingness to buy sustainable food (organic or climate friendly), revealed that among the female participants, the nature sound did not have a significant effect on WTB such products. However, for men, the nature sound did have a significant positive effect on WTB organic, but not climate friendly.

For H2, examining the positive effect of nature sound on connectedness to nature (CtN) and H3 on mood, the results showed no significant effect of nature sound on either CtN or mood, and this applied to both women and men.

For H4, on the moderating effect of sustainable information on the connection between CtN and WTB, the results showed that among women sustainable information, such as organic or climate friendly, did not moderate the relationship between CtN and WTB. For men, however, organic or climate friendly information significantly moderated the relationship between CtN and WTB in comparison with no information (control). These findings are illustrated in Figure 7, which shows the relationship between connectedness to nature and willingness to buy and how this is moderated by sustainable (organic or climate friendly information).

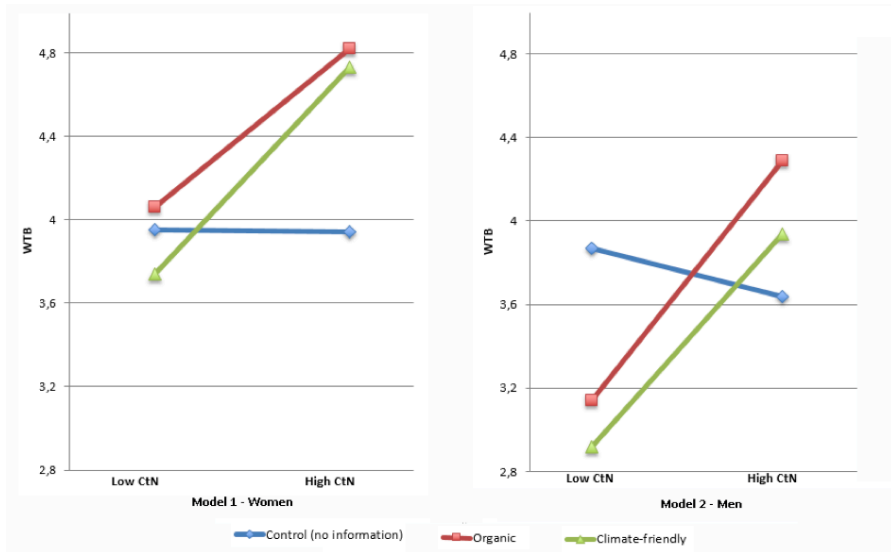


Figure 7. Illustration of the moderating effect of information (organic or climate friendly) on the relationship between connectedness to nature (CtN) and willingness to buy (WTB) for (left) women (Model 1) and (right) men (Model 2) (Paper III, p. 138).

As explained previously, even though the model for women (Model 1) visually suggested differences between high CtN and low CtN, the moderating effect of information was insignificant. The model for men (Model 2) showed that sustainable food information, such as organic and climate friendly, can affect WTB in men either positively or negatively, depending on their degree of connectedness to nature (CtN). Thus, the blue line in Figure 7 (Model 2) illustrates that when the sign communicates the control information “eat more carrots”, there is no significant difference in WTB among men who are either high or low in CtN, but when sustainable information (organic or climate friendly) is communicated WTB is affected (the red and green line). Among men with low CtN, the reported WTB decreased, whereas for men with high CtN reported WTB increased (Figure 7).

5.4 Paper IV

The results of the focus group discussions testing the Swedish Meat Guide indicated that the type and detail of indicators included in the guide are suitable for the target group “the interested consumer”, with the exception of ‘Use of pesticides’, which was misinterpreted. The Traffic Light System (see Figure 4) was appreciated and the focus group participants also correctly interpreted the additional signs used to give extra information on some specific issues, such as

e.g. labels. The discussions and reflections that emerged during the assignment also revealed that the participants were seriously worried about the issues addressed by the guide. However, despite acknowledging the importance of reducing the externalities caused by consumption choices, many participants expressed difficulties in being a sustainable consumer in daily life. Examples of aggravating circumstances cited were social context and situations with established meat-eating traditions, *e.g.* dinner with parents and friends with a strong preference for meat and limited knowledge of preparing vegetarian food or more sustainable alternatives. Practical obstacles also included actual planning of meals, which is often structured according to a specific recipe or a raw product, which in turn may be difficult to replace with more environmentally-friendly substitutes. Vegetarian diets were also seen as more time-consuming, which requires a commitment that differs from conventional diets, meaning that lack of time hampers the possibility to be vegetarian. Throughout the interviews, it was also evident that the participants made a distinction between eating at home and in restaurants. Dinner outside the home was more meat-based, because it was a treat (which appeared to be meat) or because of lack of sufficiently interesting vegetarian alternatives. Some participants also appeared to consider restaurants a free zone where choice is not as clearly linked to externalities, almost as if the matter were outside their control.

During the discussions, participants also reported what they experience as unique qualities of meat (texture and flavour). In discussions on the nutritional differences between meat and vegetables, protein levels in vegetarian alternatives emerged as a negative quality aspect. However, expected positive health outcomes of a more vegetarian diet were also mentioned.

In the interviews, the importance of trustworthy information on issues such as producer information and country of origin was emphasised. The importance of such information was further manifested in the understanding that a lack of labelling was equated with low quality. It also became evident that labels that communicate organic production schemes are regarded as a link of trust between the producer and the consumer who, due to great distance, has no visibility into the production method.

Ethical considerations that emerged included whether meat consumption can ever be justified. During the assignment the participants also mulled over the issue of ranking different animals, *e.g.* whether the life of a lamb is worth more than the life of a chicken. Participants requested that ethical considerations be added to the Swedish Meat Guide as a fifth requirement.

The discussions also included the consideration that choices made in Sweden might have a global climate impact. It was argued that the rich part of

the world should show solidarity with the less privileged part and eat less meat, as poorer people, who are not able to enjoy high animal protein diets, still have to help pay the environmental price of meat production.

The outcome of the ranking assignment revealed both similarities and differences between focus groups, but all groups put either meat from wild game or legumes as the most environmentally friendly product, following the ranking in the guide.

6 Discussion

6.1 Need for a change

Based on the understanding that dietary change is necessary to meet climate change, the research in this thesis contributes to the issue of how to inform and communicate this fact. It can be concluded that the concept of climate mitigating food consumption appears to be scarcely communicated by retailers. The results also indicate that to promote a change to a more vegetable-based diet, product development is necessary for vegetables to be perceived as tasty, convenient and easy to use.

At the same time, consumers revealed strong expressions regarding negative environmental associations to packaging, which highlights the present challenges for producers to communicate positive benefits of packaging and thus increase the perceived convenience of such products.

The outcome of the observations revealed a lack of retailer communication of direct climate mitigating information within the investigated supermarkets. This opens the way for actors within the fruit and vegetable industry to address and communicate the climate mitigating property and credence cue of vegetables as a food alternative.

The experiment with sound and information (Paper III) showed that nature sounds did not directly influence willingness to buy (WTB) organic or climate-friendly foods when the whole group was examined, but for the male group such an effect was found for WTB organic. Depending on their Connectedness to nature (CtN), information either raised or lowered the WTB organic or climate-friendly products among the male group. Thus the male subjects were interpreted as being at an earlier stage of the Trans Theoretical Model (TTM) described in section 3.1.

Finally, the research illustrated that among already interested consumers, climate has high priority when choosing food and understanding the

connection between food and climate. These consumers are able to understand and use a multi-layered environmental guide (the Swedish Meat Guide), which includes carbon footprint, biodiversity, chemical pesticides and animal welfare. However, for practical and social considerations meat is perceived as much more convenient and socially acceptable than vegetables.

6.2 Addressing the complexity

Taken together, the results show the complexity of adopting climate mitigating food consumption and the breadth of knowledge required for consumers to make such informed decisions. This complexity, which is the basis for climate mitigating food choices, may be seen as one important reason why retailers rarely inform and communicate about climate mitigating food consumption – the message is simply too difficult. This assumption is supported by the fact that retailers have made some attempts at communicating similar concepts, such as carbon footprint and “The Easy Way”, but terminated these because they were perceived as too difficult and costly to implement.

Considering the complexity, other choices that could be promoted by retailers, following the idea behind nudging (see section 3.2) could perhaps be more easily implemented within a retail environment. Nudging might also lead the male group to progress through the stages in the TTM (see section 3.1). What the complexity means is that knowledge and understanding, as well as suggested actions, have to be communicated on multiple levels and by multiple stakeholders, taking into consideration the great difference in knowledge levels and motives between consumers.

One reported explanation for the lack of climate mitigating food information in supermarkets is the contradiction in arguing for reduced trade, and thus selling less, within supermarkets (Jones *et al.*, 2011; Jones *et al.*, 2009). Thus the suggestion by Garnett (2011, see Table 1) to eat less meat and not to eat “more than needed to maintain a healthy body weight” is difficult to implement in a retail environment. The retailer argument that meat is an important tool in attracting consumers to the store (Tjärnemo & Södahl, 2015) constitutes a reported obstacle. Yet it is important to emphasise that climate mitigating food consumption calls not only for a decrease in specific product assortments, such as meat, but simultaneously an increase in other product groups, such as vegetables.

An additional explanation for the lack of climate mitigating information may be the novelty of the concept. It appears that messages such as those suggested by Garnett (2011) are no longer as provocative as during the initial phase of the project. It also appears as though the concept of eating less meat is

now more generally accepted, as shown for example by the increased interest in flexitarianism.

The identified use of indirect climate mitigating communications, such as seasonal, local and healthy foods, reveals cues that are not used to directly address climate mitigating food behaviour, but more sustainability in general. However, what is interesting about these established cues is that they may indirectly guide consumers towards making climate-friendly food choices and raise awareness of the issue. As discussed, indirect and ambiguous information may thus function as a gateway to climate-friendly food consumption.

Using 'organic' as an umbrella term for several sustainability cues, including climate friendly, can be one way forward. However, it could also be regarded as preventing 'new' sustainable consumers adopting climate mitigating food consumption, due to the observed negative effect of organic information on WTB. If climate friendly becomes synonymous with organic, it may result in failure to recruit 'new' consumers who have the potential to be climate friendly, but do not see organic as a relevant guiding tool.

In the interviews with interested consumers (Paper IV), the importance of trustworthy credence cues was manifested through an expressed lack of trust in products that were unlabelled, which were equated with poor quality. It also became evident that credence labels were regarded as a link of trust between producer and consumer who, due to great distance, has no visibility into the production method. Information on packaging and features like origin, production schemes (organic), recipes and cooking instructions, brand and product name and shelf-life were also viewed as positive (Paper I), underlining the importance of communication on packaging, as discussed by *e.g.* Nancarrow *et al.* (1998) and Silayoi and Speece (2004, 2007). These findings thus imply that consumers are affected by information presented.

6.3 Use of sounds

The aim of the experiments with sound was partly to investigate whether retailers could use nature sounds to increase WTB products communicated as climate friendly or organic, based on congruency theory (see section 3.4). The result illustrated that the chosen nature sound did have a significant positive effect among men on WTB organic, but not climate friendly. Thus the results partly confirmed the general claim made by companies selling such sound systems that nature sounds have a positive impact on sustainable food choices. However, another important finding emerged during the pilot-study, in which it became apparent that a particular cue, such as birdsong, can be perceived in a multitude of ways. Birds can be associated with nature, but in a retail

environment they can also be associated with unsanitary conditions. As found previously by Lunardo & Mbengue (2013), deliberately introduced atmospheric cues can also be (negatively) perceived as manipulation, and this feeling was expressed in the pilot-study to Paper III. Thus retailers should be cautious with the use of sounds, since the associations they may evoke are not always positive. This calls for other means of change within the vegetable department in supermarkets.

6.4 Developing the vegetable department

Another tool to facilitate implementation of climate mitigating food consumption is to develop products that are climate friendly, such as vegetables. Previous studies, covering Sweden, have identified this category as mainly promoting products as commodities, which implies great potential for product development. Additional recent findings add to the present relatively low degree of product development within the fruit and vegetable sector (Fernqvist, 2014; Spendrup & Ekelund, 2009; Ekelund *et al.*, 2008). Based on the results in Papers I and IV, consumers lack convenient alternatives, yet express negative associations when presented with such options. Such mixed messages are of course challenging but, as pointed out in Paper I, may not reflect an absence of consumer demand, but rather habitual consumer behaviour, preconceptions and lack of information.

Even among those consumers who recognise that the climate effect of food is important, meat appears to have an advantage over vegetables, mainly since it is perceived as more convenient, less complicated and associated with unique qualities of texture and taste. This indicates quality aspects that need to be met by vegetarian alternatives in order for such products to be regarded as alternatives to meat. Matching the experienced qualities of meat is not easy, as illustrated in previous studies by Lea and Worsley (2003), who concluded that the enjoyment of eating meat is the main reason why both men and women find it difficult to become vegetarian. The identified barriers to more climate-friendly food consumption are further supported in the literature, which shows that unwillingness to change eating habits, a strong belief in the importance of meat in the human diet and a lack of perceived ability to prepare vegetarian food all contribute to perceived difficulties with being vegetarian (Ruby, 2012; Lea & Worsley, 2003). However, one important understanding of adopting climate mitigating food consumption is that the consumer does not have to convert to a whole vegetarian diet, but just decrease overall intake of meat or choose a better alternative.

One alternative in developing climate-friendly products, such as vegetables, that are perceived as more convenient could be to apply novel packaging and materials (see section 3.3). The results from Paper I indicate that the benefits of novel materials are badly communicated to consumers and that there are challenges in communicating positive features of some materials. Wikström and Williams (2010) showed that the material as such usually has a lower environmental impact than the product itself throughout its life cycle. From this perspective, less waste due to ruined products may be a counter-argument to be communicated. However, plastic was seen by some respondents as ‘unhealthy’, indicating that consumers may perceive risks with the food it covers. This poses a challenge for food suppliers seeking to communicate food safety. Plastic packaging was also viewed negatively in environmental terms as being ‘bad for the environment’ and ‘affluent’. Different packaging materials are perceived as differing in their environmental impact (Lindh *et al.*, 2012; Van Dam, 1996). As discussed by Lindh *et al.* (2012), consumers tend to focus on material properties only when it comes to ethical environmental perspectives, while the important role of product protection seems to be omitted. The environmental impact of product packaging is an important aspect of consumers’ product perception, balanced against personal benefits such as convenience (van Dam & van Trijp, 1994).

The indirect climate mitigating communications mentioned above (seasonal, local, healthy) could all be used together with fresh and attractive products to promote vegetable sales. Another important tool in developing fruit and vegetable consumption is to apply the concept of nudging and support the sale of *e.g.* vegetables through displaying such products in more favourable ways.

6.5 Contribution to science and suggestions for future research

The theories used within Papers I-IV cover a great diversity of consumer behaviour, and ranges, from congruency in a retail atmosphere to how consumers interpret and understand multi-layered environmental information. The empirical findings in Paper I extend findings from previous studies and indicate that future studies should focus on how to address the positive aspects of packaging to consumers. Increased knowledge about consumers’ views is essential in understanding consumer choice and developing attractive products and packaging. Implementation of the novel findings presented here can act as a first step in improving food packaging design practice for the mutual benefit of consumers and suppliers. Considering that Paper I focused on potato, future

studies on other vegetables may be needed in order to draw conclusions on packaging.

During the initial search for literature for Paper II, lack of definition of a concept that could function to operationalise the climate impact of food became evident. The operationalisation in Paper II should be regarded as a contribution to the development of such a concept. The illustration and documentation of present concepts of sustainability (local, seasonal, organic, Fair Trade, climate mitigating) also provided a conceptual framework for understanding the complexity in making a sustainable or climate-friendly food choice. Future research should investigate whether these indirect routes, *e.g.* organic, local and seasonal, are relevant alternative shortcuts to foster climate mitigating food consumption, through the use of established sustainability cues. Future studies should also explore what associations the concepts of climate-friendly and climate mitigating food consumption evoke. It should be added that the observations in Paper II would have benefited from interviews with the store managers and staff regarding the concept.

The research in Paper III was challenging due to the theoretical and methodological issues involved in implementing the experiments. However, the experimental setting enabled the experiment to test for and confirm some aspects of congruency theory in a new empirical setting, contributing to its theoretical generalisability (North *et al.*, 1999). Yet since only one sound, one product and one store were included, the results cannot be generalised. Moreover, variables such as mood and connectedness to nature are not easily measured and it could be questioned whether it is reasonable to assume that such states can be measured through a survey in a busy supermarket, and how that environment affected the responses. While it can be argued that organic may be used as an umbrella for sustainability and function as a gateway to sustainable food consumption, it is important to understand that some consumers express lower willingness to buy when a product is labelled organic. These consumers should be further investigated regarding how and why they can be reached with information that food and climate are connected.

In order to increase understanding of the use of nature sounds, future research should focus on the sound itself, obtain consumer definitions of different sounds from nature and study which sounds are relevant for which products. Such studies could be performed in a laboratory setting, allowing the effect of the specific sound to be isolated.

Paper IV provided empirical insights into consumer interpretation of detailed multi-layered environmental information. It also provided empirical support for the assumption that this specific consumer group, the interested consumer, can distinguish between underlying arguments. Methodologically,

inclusion of a jointly performed assignment was a successful approach in understanding how well the Swedish Meat Guide functioned.

Studies exploring consumer arguments for buying organic reveal that it is not only environmental issues that are of top priority for choosing these products, but also health. Such findings indicate that future studies should explore other consumer-perceived benefits, such as, and perhaps primarily, health aspects, of eating more fruit and vegetables, in order to identify relevant qualities to address in promoting such consumption. Considering the scope of climate mitigating food consumption, one suggestion is to explore the display of relevant products through the use of nudging.

6.6 Conclusions and reflections

The identified difficulty in handling such complex issues as food and GHG emissions suggests that future communication strategies should not only focus on how to enable consumers to make informed choices, but also guide them towards making climate mitigating food choices. The difference between these two routes may not be obvious at first glance, but they both represent an emphasis on either rigour or relevance. Rigour here reflects the positivistic empirical approach of science where the complex link between GHG emissions and food is identified. Relevance represents the more pragmatic and applied approach of science looking to use this finding and implement it within human food consumption. It is crucial to accept the importance of both rigour and relevance and embrace the understanding that they represent two sides of the same coin.

Considering the overall aim of this thesis to examine the use of climate mitigating information within a retail environment, it is clear that researchers wish to illustrate the complexity, but that the scientific format is not suited for the needs of retailers, who need simple consumer-orientated advice to help implement climate mitigating food consumption. The present lack of 'ownership' of the concept of climate-friendly and climate mitigating food implies a possibility for interested actors, retailers and producers to claim the concept. To seize this opportunity, stakeholders need to develop a marketing and product development strategy, with a clear consumer perspective, by using messages relating to values such as health and trust, and not solely GHG emissions. Moreover, an increased level of convenience of vegetable-based products would enable such products to fit more easily into normal daily life. Overall, it is evident that future research has to continue searching for an increased understanding of how to interpret and affect consumer behaviour, in

order to attract not only those consumers who are convinced, but also those who are sceptical to adopting climate mitigating food behaviour.

To support the horticultural industry in finding relevant communication and product development approaches, researchers within horticultural science must also embrace the findings on rigour and relevance. Horticultural science, which often has a strong focus on production, has to acknowledge the importance of understanding the consumer and the value chain in order to increasingly benefit from all types of knowledge co-existing within the discipline.

As stated in the Chapter 1, horticultural science is a multidisciplinary applied science seeking to interconnect theoretical, empirical and methodological separate disciplines and subjects, *e.g.* biology, technology and business administration, in research covering all parts of the horticultural supply chain, including the consumer. A determining factor for advancement of the discipline and its separation from basic sciences has been the emphasis on the interdependence between research and practitioner. Today, when society is facing global issues such as climate change that need to be tackled from a multitude of aspects, there is an urgent need for interdisciplinary research. Characteristics of horticultural science that were earlier regarded as less important aspects are thus now considered important tools in solving complex problems.

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Appendices

Appendix 1 – Interview guide Paper I

The attached interview guide is summarized and translated into English (the original version was more extensive and in Swedish)

Introduction

Short presentation of the Potato project
Short presentation of the method Focus group
Technical details
Presentation of participants

Introductory questions

When do you buy potato?
What characteristics are important when you buy/choose potato?
Does potato have any unique quality?
What is important when you buy potato?

Packaging

Packages are picked up and placed on the table
Reflection paper handed out
Participants are requested to write down short reflections.

Discussion on each product

How can it be used?
How can it be cooked?
Pros and cons with the product
The effect of Price

Why should they be selected?

What do you think about the package?

Attitudes toward potato

Positive and negative aspects of potato.

Appearance, nutrition

Easy to use, label, price, meal, origin, local, package, taste, health, production method (organic)

Sensory aspects; visual, feeling, taste, smell

Appendix 2 - Observation guide Paper II

Date/Time/Store/City:

1. A General information regarding Climate Smart Food Choices

The visual inspection starts 5 meter outside the store/outside the entrance to the store.

“The walk through” starts with a basic visual inspection of the store and a collection of any available printed material (brochure, pamphlets, company magazine and leaflets) in the store. During “the walk through” observations are being made by looking at banners, posters, television screens, on shelves, shelf edges, on products, information leaflets, promotional leaflets and flyers. The observation covers all areas of the store where edible products are exposed.

Which of the described possibilities did exist? Did any of them dominate?
Other?

1. B General information regarding dominating marketing communication

During “the walk through” observations are being made by looking at banners, poster, shelves edges and products. The observation covers all areas of the store where edible products are exposed. Shelves are scanned but not looked at in detail.

Observations that are of interest are for example price information (for example buy one get one free, buy more than one, get a discount, special offer) and campaigns or offers that encourage consumption etc.

2. Categories in detail

Packaged fresh beef (all products that are found in the section for fresh beef, also vacuum packaged beef)

Packaged fresh pork (all products that are found in the section for fresh pork, also vacuum packaged pork)

Packaged fresh chicken (all products that are found in the section for fresh chicken, also vacuum packaged chicken)

Packaged frozen fish

Packaged frozen vegetarian alternatives (quorn, soy etc)

Packaged beans

Vegetables, including potato

3. Details of Interest

Climate Smart Choice (arguments etc). Who is the sender of this message (supermarket, the brand, a government agency)?:

Informational signs (cooking information, information of meat cuts, recipes, information about different brands):

Shelf edges (Price, information, labels, origin). What information, brands, messages are given space on the shelf edges?:

Packaging (country of origin, brand, local production):

Other:

3 Drawing a map of the store

Simple map of how the categories were organised in the store. What categories were placed next to each other? The categories that were studied in detail are of special interest for this part.

Appendix 3 – Questionnaire paper III

Questions included in Paper III are reported in English in table 3, Chapter 4.



Datum KI ID KT

	Håller inte alls med			Neutral			Håller helt med	
Just nu är jag på bra humör	1	2	3	4	5	6	7	
När jag svarar på de här frågorna känner jag mig glad	1	2	3	4	5	6	7	
Jag känner mig obekvämt just nu av någon anledning	1	2	3	4	5	6	7	
Just nu känner jag mig spänd eller irriterad	1	2	3	4	5	6	7	
Idag tycker jag att det är för många kunder i butiken	1	2	3	4	5	6	7	
Jag känner att jag enkelt kan ta mig fram i mitt eget tempo i butiken	1	2	3	4	5	6	7	
Idag tycker jag att butiken känns väldigt trång	1	2	3	4	5	6	7	
Jag tycker att butiken är lite för stökig idag	1	2	3	4	5	6	7	
Idag upplever jag att kundtätheten är låg	1	2	3	4	5	6	7	

Ta gärna en titt på morötterna framför dig innan du svarar på de här frågorna!

	Väldigt låg			Varken eller			Väldigt hög	
Sannolikheten att kvaliteten på de här morötterna är tillförlitlig är...	1	2	3	4	5	6	7	
Sannolikheten att de här morötterna är färska är...	1	2	3	4	5	6	7	
Sannolikheten att de här morötterna smakar bra är...	1	2	3	4	5	6	7	
Jag tror att de här morötternas kvalitet är...	1	2	3	4	5	6	7	

Antag att just de här morötterna du tittar på kostar 10 kr per kilo.

Markera siffran var på skalan 1-7 som din åsikt bäst stämmer in (4 = varken eller)

De här morötterna är inte alls prisvärda	1	2	3	4	5	6	7	De här morötterna mycket prisvärda
De här morötterna är ett dåligt köp	1	2	3	4	5	6	7	De här morötterna är ett bra köp
Priset på de här morötterna är inte alls rimligt	1	2	3	4	5	6	7	Priset på de här morötterna är absolut rimligt
Köper man de här morötterna får man inte mycket för pengarna	1	2	3	4	5	6	7	Köper man de här morötterna får man mycket för pengarna

Försök känna efter hur du känner just nu när du svarar på följande frågor – inga svar är rätt eller fel!

	Håller inte alls med			Neutral			Håller helt med	
Just nu känner jag att jag är en del av naturen	1	2	3	4	5	6	7	
Jag känner inte någon samhörighet med växter, djurliv och annat i naturen just nu	1	2	3	4	5	6	7	
Just nu känner jag en närhet till naturen omkring mig	1	2	3	4	5	6	7	
Just nu känner jag mig djupt medveten om att mina handlingar påverkar naturen	1	2	3	4	5	6	7	
Just nu känner jag mig avskärmad från naturen	1	2	3	4	5	6	7	
Just nu känner jag att naturen är en gemenskap som jag tillhör	1	2	3	4	5	6	7	
Just nu känner jag uppskattning för andra levande varelser	1	2	3	4	5	6	7	

Antag att just de här morötterna du tittar på kostar **10 kr per kilo**.

	Väldigt låg			Neutral			Väldigt hög	
Sannolikheten att jag skulle överväga att köpa sådana här morötter idag är...	1	2	3	4	5	6	7	
Sannolikheten att jag <i>kommer</i> köpa sådana här morötter idag är...	1	2	3	4	5	6	7	
Min vilja att köpa sådana här morötter idag är...	1	2	3	4	5	6	7	

	Håller inte alls med			Neutral			Håller helt med	
Om jag skulle köpa morötter idag, skulle jag överväga att köpa just sådana här morötter	1	2	3	4	5	6	7	
Till det angivna priset skulle jag kunna tänka mig att köpa sådana här morötter idag	1	2	3	4	5	6	7	

Kön: Kvinna Man

Ålder: _____

Stort TACK för din medverkan!

Appendix 4 - Interview guide Paper IV

The attached interview guide is summarized and translated into English (the original version was more extensive and in Swedish)

Interview guide – The Meat Guide

Material: All participants receive an example of the Meat Guide.

Introduction

Short presentation of the method Focus group

Technical details

Presentation round

Key questions

How does the consumer interpret the environmental impact of meat?

What theoretical choice does the consumer do based on the Meat Guide?

Subjective and objective understanding

Traffic light/information over load/complex message

The ranking assignment

Finalizing questions

How can the Meat Guide be used?

What can be improved? What was easy/difficult to understand?

Final question

The purpose of this discussion has been to gain insight into how you use the Meat guide and to identify possible problems with the information

Would any one of you like to add something?