



The Complexity of
Freshness and Locality
in a Food Consumption
Context

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Department of Biochemistry**

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ABSTRACT

The life cycle of food trends have shortened considerably, but freshness and local origin seem to retain their appeal. These two concepts are often discussed in academic as well as consumer contexts, but they lack generally accepted definitions. Local food is typically bound to information that include cues such as place of production or farming practices. The concept is similar to freshness, which is not verified using only the senses, but also product-related information. Freshness and local food are often referred to as being desirable, but the true appeal to consumers requires further study. The supply chains for fresh and locally produced food are constantly developing, but the main focus is on solving practical issues rather than providing new input for academic discourse.

The overall aim of the thesis was to study freshness and locality as value-adding factors in the food consumption context, as well as examining the similarities and differences between these concepts. For both of these concepts, models were constructed to broaden the academic perspective, and thus enabling more thorough research on the subject. This study investigated the role of sensory properties on the experience of freshness (fresh and cooked), the effect on the experienced quality of information on food origin, and the effect of personal value orientations.

In this work, both locality and freshness added value to the product. The results indicated that the effect of freshness can also be perceived in the cooked product, and not only, as is usually considered, when it is uncooked or in a raw state. The appreciation of freshness was seen to be more relevant to individuals valuing good sensory qualities, while the appreciation of local food was related more closely to personal value orientations. The concept of local food is based on expectations of desirable product attributes, because the locality cannot be standardized. Personal values explained the preferences based on product origin, but the effect was dependent on product type and demographic factors. Freshness is more often seen as a token of good quality and safety, which may be more appealing especially to hedonistic individuals. Even though the two concepts overlap, they do not describe the same concept, as local food has stronger ties to ethical conduct, which is not typically connected to freshness.

This work provides a starting point for conceptualizing freshness and local foods, and the link between them, by introducing models. Despite the two concepts being separate, the similarity between them in certain areas infers an existing link that should be considered in the future.

SUOMENKIELINEN ABSTRAKTI

Tiedonkulun nopeutuessa ruokatrendien elinkaari on lyhentynyt huomattavasti. Muiden trendien hiipussa tuoreus ja lähiruoka ovat säilyttäneet houkuttelevuutensa kuluttajien keskuudessa. Termejä käytetään yleisesti sekä tutkimuksen että kuluttajien parissa, mutta kummallekaan käsitteelle ei ole yksiselitteistä määritelmää. Lähiruoan kokemukseen liittyy tieto esimerkiksi tuotantopaikasta tai viljelytavoista. Tuoreus taas koostuu tuotetiedon lisäksi aistittavista ominaisuuksista. Sekä tuoreutta että lähiruokaa pidetään yleisesti laadukkaana, mutta väitteen todenmukaisuus kuluttajien keskuudessa vaatii lisätutkimuksia. Tuoretuotteiden ja lähiruoan toimitusketjuja kehitetään määrätietoisesti, mutta tavoitteena on enemmän saatavuuden parantaminen kuin tuoda uutta tietoa tieteelliseen keskusteluun.

Työn päätavoitteena oli tutkia tuoreutta ja paikallisuutta lisäarvon tuottajina ruoan kuluttamisen kontekstissa, mutta samalla tutkia käsitteiden yhtäläisyyksiä ja eroja. Sekä tuoreuden että lähiruoan osalta rakennettiin malli, jota voidaan hyödyntää tieteellisessä tutkimuksessa näiden käsitteiden osalta. Tutkimus käsitteli aistittavien ominaisuuksien osuutta tuoreuden kokemisessa sekä käsittelemättömissä että kypsennetyissä tuotteissa. Lisäksi tutkittiin ruoan alkuperätiedon vaikutusta sen koettuun laatuun sekä alkuperätiedon suhdetta kuluttajien arvomaailmaan.

Työn tulosten perusteella sekä tuoreus että alkuperä tuottavat tuotteisiin lisäarvoa. Työssä havaittiin, että tuoreus on havaittavissa myös kypsennetyssä tuotteessa, eikä pelkästään raaka-ainassa tai kypsennettämättömässä, kuten yleensä oletetaan. Tuoreuden merkitys voi olla suurempi sellaisille kuluttajille, jotka arvostavat erityisesti miellyttävää aistikokemusta, kun taas lähiruoan tärkeys on voimakkaammin sidoksissa henkilökohtaiseen arvomaailmaan. Mielikuva lähiruoan ominaisuuksista perustuu odotuksiin miellyttävistä tai tärkeistä ominaisuuksista, koska lähiruokaa ei voida yhdenmukaistaa. Yksilön arvomaailma selitti ruoan alkuperän vaikutuksia sen koettuun laatuun, mutta vaikutus oli riippuvainen tuotetyypistä sekä vastaajien iästä ja sukupuolesta. Tuoreus nähdään usein takeena hyvästä laadusta ja turvallisuudesta, joka voi olla kiehtovampi aistinautintoja arvostaville kuluttajille. Vaikka näillä kahdella käsitteellä on monia päällekkäisyyksiä, ne eivät kuitenkaan kuvaa samaa asiaa. Lähiruoan kuluttaminen nähdään usein eettisenä valintana, jota ei tavallisesti yhdistetä tuoreuteen.

Tämä työ tarjoaa viitekehyksen, joilla sekä tuoreus että lähiruoka voidaan käsitteellistää hyödyntäen työssä rakennettuja malleja. Vaikka työn perusteella käsitteet ovat toisistaan eriäviä, se antaa viitteitä siitä, että niiden välistä yhteyttä on mielekästä tutkia tarkemmin.

LIST OF ABBREVIATIONS

FDA	U.S. Food and Drug Administration
PCA	Principal component analysis
SFSC	Short food supply chain

LIST OF ORIGINAL PUBLICATIONS

- I. Kumpulainen, T.; Sandell, M.; Junell, P.; Hopia, A. The effect of freshness in a foodservice context. *J. Culin. Sci. Technol.* **2016**, 14, 153–165.
- II. Kumpulainen, T.; Sandell, M.; Hopia, A. Effect of component quality on sensory characteristics of a fish soup. *Food Sci. Nutr.* **2018**. (In Press)
- III. Kumpulainen, T.; Vainio, A.; Sandell, M.; Hopia, A. The effect of gender, age and product type on the origin induced food product experience among young consumers in Finland. *Appetite*, **2018**, 123, 101–107.
- IV. Kumpulainen, T.; Vainio, A.; Sandell, M.; Hopia, A. How young people in Finland respond to information about the origin of food products: The role of value orientations and product type. *Food Qual. Prefer.* **2018**, 68, 173–182.

1 INTRODUCTION

Consumers today are constantly bombarded with marketing messages about food with added functional properties. The Internet provides channels filled with information about nutrition and food, but it is difficult to sift the truthful information from among the myriads of fabricated news or sites only created to serve commercial purposes. Faster communications have caused food trends to fluctuate all around the world. However, two things have persistently retained their appeal: freshness and local food. Freshness and locality are among the emerging topics such as, food without additives, organic food, and vegetarian diets, to mention some examples. Moreover, these trends seem to have strict definitions leaving little to be speculated about their content. To achieve this type of clarity, more discussion is needed about the true nature and definition of freshness and local food. According to the Nielsen Perishable Groups's FreshFacts® (2015a) the sales of fresh vegetables grew 5 % during 2014 compared to canned or frozen vegetables. There is an increase in demand for fresh products, which can be seen in sales and marketing by their use of an increasing number of phrases indicating product freshness (Sloan, 2015). A recent example in Finland regarding the popularity of fresh produce is the harvest season calendar (Unknown, 2018), which guides consumers to benefit from the seasonality of fruits and vegetables. This indicates that freshness still has a strong position in the minds of consumers, which is not satisfied simply by clever marketing about fresh-like qualities, because the actual freshness does count. A report by a research company called Packaged Facts (2015) stated that in the United States the sales of local foods was \$ 12 billion in 2014 and they estimated that the sales will grow to \$ 20 billion by 2019. In Finland, the so called REKO networks, which connect consumers directly with the producers, are increasingly popular with over 300 000 members in the network (Mustonen, 2017). The networks enable consumers to pre-order products directly from farmers, who then make the delivery on specific dates to a temporary market place.

Freshness and locality may represent the modern consumers' counter reaction to globalized food chains. Due to the elongation of food chains either fresh or locally produced food are not always readily available (Giovannucci et al., 2010). The centralized wholesale and retail sectors control the supply chains to such extent that globally sourced food without a known origin has become the new norm, but the current trend does not satisfy all consumer segments. Even industrial cooling or technology in general have made consumers less dependent on fresh, locally produced food and seasonality, however, these concepts have retained most of their original appeal and food being merely safe to consume is not enough. Pirog (2004) suggested that there is a possibility to construct a contextual link between local food and freshness and both terms used

simultaneously can influence consumers. This kind of connection is already used in marketing (Figure 1), but there is lack of research-based evidence about the nature of this kind of link. The meaning of these terms overlap. For example, in a study by Pirog (2003) freshness was the most important reason for buying local products, and 90 percent of the respondents preferred local products accompanied by a claim indicating freshness. Both terms have many similarities and expected qualities, which can be achieved by shorter supply chains. In a study by Péneau et al. (2009) all the non-sensory attributes attached to the product freshness were either location (from the field/tree etc.), time (freshly harvested/short transport), or processing (not stored for a long time, no chemicals, not canned...) all of which can be considered being close to the original product. Consumers who frequently buy local foods are showing significantly more interests in fresh and unprocessed products in contrast to non-buyers (Miroso & Lawson, 2012).



Figure 1. Example of freshness linked to local origin in a marketing context (Picture by Tommi Kumpulainen, August 2017 in Providence, United States)

As fresh foods and local supply are persistently popular, numerous projects in Finland and globally have been executed and are on-going in universities, development organizations, and farmer coalitions. The aim of these projects are to offer practical tools to match the increasing demand, and the incremental development work has proven to be an efficient way to increase the availability and profitability of short food supply chains. However, this type of work is not academic in itself, and despite active development efforts, there is a clear gap in knowledge about the concepts of freshness and local food. Due to this disparity, these concepts need to be clarified more thoroughly in order to take the discussion further.

The overall aim of the thesis was to study freshness and locality as value-adding factors in the food consumption context and to study the link, similarities, and differences between these concepts. In general, food quality is considered as being a highly complicated matrix of sensory properties, personal preferences, and extrinsic information cues and similar construct may be applicable to the freshness and local food. The literature review concentrates on understanding these terms in a holistic sense. Even though both themes are widely debated and discussed in the scientific literature, these terms nonetheless need comprehensive models. Models and details about their specific features are needed to broaden the academic perspective, thus enabling more thorough research on these concepts. The perception of local food is typically bound more to information cues relating to the temporal or physical distance to the place of consumption. The concept is similar to freshness, which is not verified using only senses, but also using our cognitive capabilities. Freshness and local food are often referred to as desirable, but the true appeal to consumers needs further studies. The experimental part was aimed at studying certain elements of these concepts which were identified as important: the role of sensory properties in the freshness experience (fresh and cooked) and the effect of information on food origin on the experienced quality.

2 REVIEW OF THE LITERATURE

2.1 Food quality

In the review by Reeves and Bednar (1994), the most relevant measure of quality for consumers was the product meeting and/or exceeding expectations, but the relevant definition is also context-dependent. If the expectations are not met, the disconfirmation causes disappointment lowering the experienced quality (Deliza & Macfie, 1996). Quality is a construction with both objective and subjective attributes which forms a combination resulting in the overall quality (Henchion and McIntyre, 2000). The objective quality is not dependent on human perception, while on the other hand subjective quality is sensed or experienced by the consumer (Giusti et al., 2008). Subjective quality is also highly relative on the person, place, and time (Cardello 1995). It is rather difficult to foresee if a food product will be considered appealing or not without any prior experience of the consumer's preferences or in depth knowledge of the consumers in question. In its simplest form, the quality of the product is something that possesses characteristics that are appealing to the consumer and which are not possessed by a standard or a bulk product.

The improved quality may not be created without any additional information as the consumers may not have any expertise on the product quality and hence they may be poor at predicting the quality. In some cases, the extrinsic information can have a strong impact on taste perception and hedonic evaluation (Teuber et al., 2016). Although more information about the product is generally considered better, it does not always have an effect or it may even confuse consumers (Grunert, 2005). To effectively add value to the product by improving food quality, the differentiation needs to be effectively communicated to the consumer (Mascarello et al., 2015). Intrinsic and extrinsic attributes may even produce conflicting evaluations, as for example, increased fat content in yoghurt increase acceptance, but the information about the increased fat content actually lowers it (Hoppert et al., 2012). The quality perception may not be stable with repeat consumption as the consumer may evolve and may become more of an expert as regards the nuances of a particular product (Deliza & Macfie, 1996; Chocarro et al., 2009; Borgogno et al., 2015). Experienced quality may also be largely dependent on the personal values of an individual consumer (Dreezens et al., 2005).

Food bought through the retail sector is most likely safe to consume and can therefore be referred to as a high quality product. However, it may not be very tasty or at least the peak of its appeal may already be long gone. Often average consumers do not want to settle for the next best thing, but they still expect to have delicious food at its prime. Therefore freshness is something worth pursuing.

For example Italian consumers consider taste, appearance and freshness as being the most important characteristics of food quality (Mascarello et al., 2015) which is in line with other studies as well (Dinnella et al., 2014; Eertmans et al., 2001; Andersen & Hyldig, 2015). Consumers may believe that small companies produce better quality food in general as they do not have the ability to compete with low prices (Henchion and McIntyre 2000) and people who are buying local foods on a regular basis are also more interested in food quality and personal service (Miroso & Lawson, 2012). For official authorities and the food industry, quality may be more about the product safety in the form of for example microbiological quality. Individuals with a high level of expertise or knowledge about the product consider a greater number of factors when making decisions, so the criteria for making a final choice are also different than with non-experts (Alba & Hutchinson, 1987; Chocarro et al., 2009). Because of this, the expert and consumer perspectives of freshness are considered separately. Food quality is a complicated matrix related to a multitude of extrinsic and intrinsic attributes about food; it offers a framework for the closer examination about freshness and locality in the food consumption context.

2.2 Attitudes and values as food choice predictors

Values are represented as certain codes that people follow under specific situations, interactions, and choices (Schwartz, 1992). They are abstract concepts of desirable outcomes or behaviors serving as guiding principles in the specific situations (Schwartz & Bilsky, 1987). They seem to apply universally as similar values are used all around the world (Schwartz, 1994). There are cultural differences between countries as some cultures value more individualistic than collectivistic values (Ryckman & Houston, 2003). Some individuals make their decisions based on hard evidence and scientific facts and others rely on their intuition and the reason may be left aside. Generally, thinking can be either intuitive or rational, where the former is more related to emotions and the latter on pure facts (Epstein et al. 1996). The way people use and process any additional information about food or anything else in that matter, connects with our values, which in turn transform into concrete actions. Gender does not seem to have a large effect on value priorities and the meanings of different values are quite equal for men and women (Prince-Gibson & Schwartz, 1998). There is also a significant overlap between personality and values (Anglim et al., 2017).

According to the largely adopted theory by Schwarz (Schwartz, 1992), people have a relatively stable value system which has an effect on our choices. Schwarz's value system forms a circular continuum with 10 universal types (Table 1), which can be condensed into two main dimension: self-transcendence - self-enhancement and openness to change – conservation (Figure 2). Each

universal value type represents different motivational goals. Individuals considering openness to change important are drawn to new experiences while the opposite group prefers the status quo. People with high importance of self-transcendence are interested in promoting the welfare of others and those at the opposite end of the spectrum are concentrated on their own personal interests. The circular value structure developed by Schwartz already exists in children at the age of five (Lee et al. 2017). In the case of children and adolescents the values may not be yet stabilized, as they are still evolving (Döring et al., 2016). Adolescents cannot be categorized as having simply hedonistic and altruistic values as they seem to be able to hold them both concurrently (Ryckman & Houston, 2003). Attitudes and perceived responsibility are the variables explaining the most variation in the choice of local and organic foods for adolescents (Bissonnette & Contento, 2001). This indicates that already at an early age behavior leading to food choices are affected or triggered by various cues not directly linked to the perceived properties. The value theory according to Schwartz can predict food choice motives (de Boer et al., 2007) such as the concerns for the sustainability of food production (Grunert et al., 2014) and attitudes towards genetically modified food (Saher et al. 2006). Brunsø et al. (2004) found that food-related lifestyles can be explained by individual value priorities. Local food is also seen as a moral choice that people use to represent positive image of themselves as is trying to demonstrate good food choices as opposed to bad such as fast food (Thomas & McIntosh, 2013).

Table 1. Description of ten basic values (Sagiv & Schwarz, 1995)

Value	Description
Benevolence	<i>Preserving and enhancing the welfare of those with whom one is in frequent personal contact (the 'in-group').</i>
Conformity	<i>Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.</i>
Tradition	<i>Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provide the self.</i>
Security	<i>Safety, harmony, and stability of society, of relationships, and of self.</i>
Power	<i>Social status and prestige, control or dominance over people and resources.</i>
Achievement	<i>Personal success through demonstrating competence according to social standards.</i>
Hedonism	<i>Pleasure and sensuous gratification for oneself.</i>
Stimulation	<i>Excitement, novelty, and challenge in life.</i>
Self-Direction	<i>Independent thought and action; choosing, creating, exploring.</i>
Universalism	<i>Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature.</i>

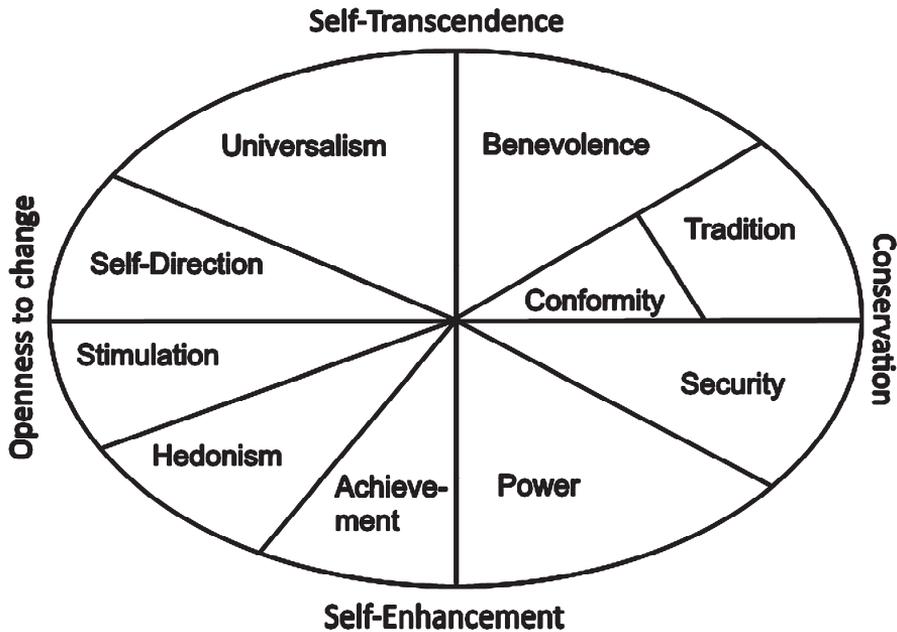


Figure 2. An overview of the basic values (Schwartz, 1992)

Appealing to one's values may cause positive responses among consumers. According to Vainio et al. (2016) concern for nature is motivating people to sustain healthier and more sustainable diets. Bratanova et al. (2015) showed that ethical product attributes cause moral satisfaction which will result as enhanced taste experiences and increase in willingness to pay. According to the writers, this was most likely due to the reward mechanism reinforcing the behavior inducing moral satisfaction. Naturally, this is dependent on individual preferences since not all the consumers share similar values. Values evidently turn into attitudes, when people are making choices or reacting to unexpected situations. The formation of attitudes are guided by the set of values the individual possesses. To obtain a more thorough understanding of the underlying factors behind the concept of food quality, personal values should be added up to the equation, especially when such complex concepts as freshness and locality are under examination.

2.3 Freshness

Freshness is a description of proximity to the original product in terms of physical, temporal, and processing distance (Péneau et al., 2009). The U.S. Food and Drug Administration (FDA) uses the following definition: "The term "fresh," when used on the label or in labeling of a food in a manner that suggests or implies that the food is unprocessed, means that the food is in its raw state and has not been frozen or subjected to any form of thermal processing or any other

form of preservation” (U. S. Food and Drug Administration, 1993). Freshness is a quality cue also for product safety as it infers shorter storage times, but product origin has similar connotations about product safety (Becker et al., 2000). Oude Ophuis & van Trijp (1995) state that freshness is an experienced quality, which can be experienced during consumption, but Nijmeijer et al. (2004) describe it as an abstract quality aspect which consumers use to judge the quality of food. Freshness perception is the result of multisensory integration, but there is also a cognitive mechanism involved (Roque et al., 2018). Freshness is not just the physically perceived properties, but it is a three-pronged entity constituting of sensory properties, product related information, and personal preferences. It can be seen as a meta-descriptor meaning that it is a combination of several other properties (Løkke et al., 2012; Dinnella et al., 2014).

Péneau (2005) examined the etymology and history of the word freshness in her dissertation. She showed that freshness is a very complicated term which caused difficulties when trying to provide an exact definition, but it typically refers to such concepts as pure, new, youth, and vitality, and on the other hand not old, stale, preserved or processed. In fact, freshness is affected significantly by the absence of certain attributes than the actual occurrence of these. For example, if terms like fibrous or shriveled are present in a carrot, it is considered as losing its freshness due to physiological aging (Péneau et al., 2007a). Similar to fresh, natural is considered something without unwanted qualities such as additives, or features like processing (Rozin et al., 2012). Freshness is product dependent as it is most commonly attached to fruits, vegetables, fish, and to some extent bakery products (Péneau et al., 2009). It is rather ambiguous whether a stored, preserved or cooked product is fresh anymore. For some products it may be synonym for recent harvesting while for others the meaning is that it has not yet gone bad or spoiled. Labbe et al. (2009) found that refreshing and freshness are closely connected, because both terms have common sensory drivers.

Freshness is typically considered as an entity, which is present in raw or uncooked ingredients, but which is somehow lost during processing. It can be hypothesized that if freshness is something that still perceivable in the final cooked product and if the customers are able to perceive traces of freshness after cooking. It is something that is actively pursued by consumers (Mascarello et al., 2015), even the meaning of the word may be rather vague. Sometimes consumers even have the opposite comprehension of freshness. For example, in a study by Péneau et al. (2009) some consumers stated that well packed products are fresh as for the others it is the exact opposite i.e. not packed means fresh. Due to the evident difficulty to provide a clear and unanimous definition, the complexity of the term will be examined. As freshness is constantly referred to in scientific literature, the different aspects of freshness were summarized based on an extensive literary search of academic studies from the last two decades, which

will be considered more thoroughly (Table 2). As the definition may vary between experts and consumers, both groups are discussed separately.

Table 2. The summary of the literary review of the meanings and properties attached to the conception of fresh and freshness

Properties	Reference
Overall degree of quality i.e. ideal sensory characteristics, increased liking, Optimal eating quality (not immature or overripe)	Péneau et al. (2007a), Ko (2009), Kader (1999)
No signs of physiological ageing (not wilted etc.)	Péneau et al. (2007a), Dinnella et al. (2014), Jung et al. (2012)
Closeness to original product in terms of distance, time, and processing. (the time from harvest to sale)	Péneau et al. (2009), Pirog (2003), Pirog (2004), Zhang et al. (2016)
Multidimensional (sensory/non-sensory), holistic, variety of properties	Péneau et al. (2009), Dinnella et al. (2014), Zhang et al. (2016), Bremner & Sakaguchi (2000), Lund et al. (2006), Roque et al. (2018)
Raw or natural product	Cardello & Schutz (2003), Zhang et al. (2016), (U. S. Food and Drug Administration, 1993), Rozin et al. (2012)
Unprocessed i.e. not frozen/stored, or thermally processed	U. S. Food and Drug Administration (1993), Food Standards Agency (2008), Behrens et al. (2010), Ares et al. (2016)
Safety/safe	Becker et al. (2000), Lund et al. (2006)
Appearance, vivid color or close to original product, not browned	Dinnella et al. (2014), Kim et al. (2015), Lee et al. (2013), Løkke et al. (2012), Wada et al. (2010), Martin-Diana et al. (2006), Peneau et al. (2007)
Textural elements of freshness (turgidity, hardness, crunchiness...) according to the product in question	Dinnella et al. (2014), Løkke(2012), Peneau (2009), Badii and Howell (2002), Péneau et al. (2007b)
Odor (fresh-like, not stale, characteristic to the product)	Løkke et al. (2012), Fenko et al. (2009), Péneau et al. (2007a), Heenan et al. (2009)
Product dependency (relevant properties for the product)	Fenko et al. (2009), Heenan et al. (2009)
Implied motion of food	Gvili et al. (2015)
Information/emotion/cognitive cues (expiry/packaging dates, processing on sight, storage time)	Dinnella et al. (2014), Kim et al. (2015), Lund et al. (2006), Altintzoglou (2012), Zhang et al. (2016), Behrens et al. (2010), Østli et al. (2013)
Nutritional quality, nutrient retention	Lund et al. (2006)
Healthy	Zhang et al. (2016)
Purchase location (local)	Zhang et al. (2016), Behrens et al. (2010), Ostrom (2006), Pirog (2003), Pirog (2004)
Not packaged	Behrens et al. (2010)

2.3.1 The complex nature of freshness

Freshness is something worth pursuing, but how can it be conceptualized and is it different than for example a product being raw? It is also a rather complex question when raw turns into fresh. A green banana is still raw and not yet ready to be consumed. It then turns slightly yellow and at some point it becomes a fresh, delicious banana appealing to a hungry consumer. After a while it develops brown spots on the peel, which signals to consumer that it is already overripe and the freshness is lost. Similarly raw meat is somewhere in between. In theory meat is in its freshest state just after slaughtering, but it needs to be tenderized to break down the meat fibers and soften the texture. Thus, the question is whether raw and fresh are not the same state of being. Raw may be the condition before a food item becomes fresh and fresh may actually be the state of the food when it is the most palatable or appealing to the consumer. In the fruit context, freshness refers to the best possible eating quality, when fruits are not immature, but not overripe either (Kader, 1999). According to the Food Standards Agency (2008) in the UK, chilled meat and fish can be described as fresh, but frozen or chemically preserved products are not fresh anymore.

The essence of freshness is remarkably multifaceted and it may even be considered as a philosophical construct. The first and foremost the question is whether freshness exists. This thought experiment can be continued by asking, 'If it exists, what is it and does it make any difference?'. This requires an ontological approach apart from natural sciences. Merriam-Webster (2018) describes ontology as 'a branch of metaphysics concerned with the nature and relations of being'. This can be complemented with a metaphysical question, what is existence? According to the Oxford dictionary (2018), existence is 'the fact or state of living or having objective reality'. We constantly refer to vegetables or fish as being fresh, so intuitively freshness must exist. I can comprehend the concept of fresh vegetables and I can point out certain properties, such as the crisp texture of lettuce or the vivid colors of fruits, as being part of freshness. Yet this is rather a subjective matter and in the eye of the beholder. Everything we talk about, such as unicorns, do not exist, so can we be sure freshness does?

Consumers having previous experiences of a product will create expectations towards the product quality (Deliza & MacFie, 1996). According to the review by Roque et al. (2018), in addition to multisensory processes, memory, expectations and background knowledge on freshness influence the overall perception. When a consumer has never eaten, seen, or even heard about such a miraculous product as fresh lettuce, what do they then expect? Is it still possible to find an objective unit of measure when trying to describe the term freshness? Or is freshness also a concept that is based on our previous experiences and the expectations we are currently holding? According to ecological valence theory,

positive experiences about objects or situations will create positive emotions towards colors associated with them and in contrary be repulsed by negative associations (Palmer & Schloss 2010). In the food consumption context, this infers that past experiences create positive experiences about fresh produce due to experienced quality or safety. This is a useful mechanism due to evolution and individual learning helping to avoid unpleasant or potentially harmful or dangerous objects or situations (Palmer & Schloss, 2010). This mechanism helps to avoid products that have lost their freshness, which could be unpleasant or even dangerous. The conception of freshness may have therefore been evolved due necessity to ensure the capabilities to choose the most nutritious and the safest produce.

Freshness is generally considered as a holistic entity. Does it still exist if one piece of the puzzle is missing? What if an individual is missing one sense? Due to various reasons such as illness and ageing, consumers may have lost a sense or capability to process information (Doets & Kremer, 2016; Laguna & Chen, 2016), which may cause incremental changes to the holistic perception of freshness. This will induce reduction in the so called eating capability which can be one of various reasons inhibiting the ability to consume food (Laguna & Chen, 2016) and alter the crossmodal correspondence of several simultaneous stimuli. For example, for blind individuals the audio-tactile correspondences are different than for the sighted (Deroy et al., 2016). Multisensory integration is highly important to information processing and the capability of performing different tasks (Spence, 2011), which is present in the food consumption context as well. For example, loss of taste or smell diminishes enjoyment of food (Laguna & Chen, 2016) and similarly the capacity to evaluate freshness based on sensory cues. The capacity to make the judgement therefore relies on the other senses or cognition. For example, how do individuals born blind evaluate the freshness of lettuce? Visually impaired people mention freshness as the one of the most important attributes as regards, for example, meat, bread, fruits, and vegetables, but the perception of freshness may be different (Kostyra et al., 2017). Besides sensed qualities, the conception of freshness then needs to rely on other than visual cues or more importantly on non-sensory cues such as dates or storage conditions, but it is also dependent on personal preferences or capabilities.

Historically, people tended to compose their diets from a large selection of individual foods to minimize the effect of toxic or otherwise harmful substances (Rozin & Rozin, 1981). Sufficient variety in the diet is beneficial from the evolutionary perspective as it assures safety and nutritional quality (Remick et al., 2009). Lee et al. (2013) found that based on the color preference of food, people tended to choose more fresh and non-contaminated products. This may be due to the inherited traits and empirical learning (Lee et al., 2013; Palmer and Schloss 2010). Roque et al. (2018) hypothesize that the degree of expertise has

the possibility to affect the freshness perception. This infers that lack of experiences diminishes or changes the experienced freshness. Individual differences in food preferences are also affected by our genetic background (Hoppu et al., 2016). Recently, it has been suggested that the fear of physical contamination is related to personal values, showing evidence of biological requirements that make values universal (Nussinson & Roccas, 2016), and this may be connected to the human tendency to ensure food safety. In relation to individual sensitivity to freshness, it may have a link with biology, individual genes, and evolution, where fresh products are favored as being more likely to be non-contaminated and therefore safe to consume.

Consumers examine freshness from several perspectives individually and collectively and the descriptions vary according to their personal preferences, capabilities, and experiences. Freshness is typically taken as a given property of food products even there is a wide variety of different types of definitions. As the definition of freshness is quite diverse with different aspects, the expert and consumers' views are defined separately as they have very different meanings. Nonetheless, there seems to be a lack of discussion about what freshness actually is. Not to go too deep into metaphysical discussions, as freshness is comprehended from the expert and consumer perspectives, it must be something that does exist as it is frequently referred to as having certain properties, but even these can vary depending on the focus group. Despite the holistic essence of freshness being well recognized, up to now, far too little attention has been paid to its true meaning and a knowledge-based freshness. According to Descartes' mind-body dualism (1641), the immaterial mind and material body are different substances, but they have causal interaction with each other. As human body is spatial and hence material, but our thoughts and values do not occupy space and are therefore immaterial. Dualism can also be applied to the concept of freshness, which clearly has an immaterial part depending on the intrinsic information and material part based on the perceived sensory properties. These material and immaterial substances are clearly distinct and one can exist without the other, which makes it meaningful to examine them separately. The question of whether the existence of freshness does make any difference in a consumer context, will be looked into more thoroughly in the experimental part.

2.3.2 Expert view on freshness

The perspective on freshness of experts, like scientists, food safety authorities, and other officials as well as the food industry, is rather technical in nature and it typically refers to properties close to the original product and it is more dependent on novel technological solutions that prevent foods from spoiling or that inhibit physical ageing. Nicolas Appert was a French confectioner who

developed his food preservation technology during early 19th century and by 1810 he was able to claim the prize in a competition established by Napoleon Bonaparte himself (Garcia & Adrian, 2009; Featherstone, 2012). The aim of the competition was to develop a safe way to preserve food to serve to the troops during campaigns. His groundbreaking invention was heat sterilization using cans and nowadays Appert is now known as the Father of Canning. Canning started the large scale preservation of food, which improved food safety considerably and also created the so called “freshness industry”, which sets the standards for the experts’ view of freshness. Another example of a ‘novel’ technical solution on a consumer-scale is the refrigerator, which was introduced for the first time in the 1920’s. Before any technological aids for preservation or storage to enable logistics, the usage of so called fresh products were limited to those used locally, within short distances and time. Historically, local origin was used as a cue for freshness and safety, as time was the greatest threat during times when proper cooling was not yet available. The traditional preservation methods such as salting, drying, or fermentation enabled the storing of food, but in a sense they can no longer be called fresh. It can be considered that the refrigerator actually ‘liberated’ people from the demand of fresh in a traditional sense and the term slowly evolved towards the technical definition i.e. being safe to consume.

As freshness is considered a valuable property especially for meat, fish, fruits and vegetable, new methods of measuring freshness are constantly being developed. The target is to find objective methods to define whether a product is fresh or not. In many cases appearance and texture are the most critical factors considering instrumental or sensorial freshness measurements, but the critical parameters need to be defined and selected carefully. In addition to instrumental measurements, the food industry places great emphasis on quality control and a 5-point scale (1= rejected, 2 = unacceptable, 3= major remarks, 4 = ok 5 = very good) is widely used, where products are evaluated by a panel of trained assessors. Without standard procedures, quality control may be inaccurate also at the professional level, because the relevant indicators may be left outside the scope. The panel should be carefully trained using several reference materials and samples to ensure they understand all the important factors contributing to every score (Lawless & Heymann, 2010). From the experts’ perspective the relevance is more on satisfying product specifications, while in the consumer context the measured data should have a link to consumer perception or otherwise it may not have much practical relevance for them.

Commonly, cooking and processing can be seen as functions where fresh-like properties move away from the original properties. Spontaneously occurring processes such as oxidation of lipids, color changes, and microbiological activity affect the freshness of products in a natural sense. These kinds of changes can be

measured instrumentally and they are a corner stone of the expert view of freshness. Freshness in a technical sense actually refers to extended shelf-life or the time period in which the product is safe to consume. Minimal processing is a term where products have undergone mild treatments (mechanical, chemical) in order to retain their fresh-like qualities by inhibiting for example microbial growth or other sorts of deterioration mechanisms (Laurila & Ahvenainen, 2002). These minimal processing methods vary from replacing heat treatments with substitutive methods (high pressure, pulsed electric field, radiation, electric arcs etc.)(Fellows, 2017), novel packaging methods (e.g. active, intelligent, bioactive packaging)(Majid et al., 2016), coating materials for food (Galus & Kadzińska, 2015) and so on. The aim is to retain the original qualities as closely as possible by using technological means. For example, according to the FDA (U.S. Food and Drug Administration, 1993) using the term fresh for a food product is still acceptable when after the application of certain waxes or coatings, after a mild chlorine or acid wash or after treating food with ionizing radiation. Sterilization moves the expiry date long into the future by increasing its stability against bacteria. Despite the processing, from the perspective of the expert, the product still may be considered fresh, as the safety is guaranteed.

When the main purpose is to retain the qualities as close to fresh as possible without fulfilling the definition of freshness (e.g. unprocessed) we are struggling with very fundamental matters. The technical definition is actually close to uncooked or raw and safe to the end-user, but the fresh perception from the consumer's point of view is not included. For example according to the strict definition, bread is not actually fresh if it is baked using heat treatment. This is rather counterintuitive from the consumer's perspective, as without baking, bread is actually a piece of dough and on the other hand freshness is a fundamental part of experiencing the quality of bread. Another example of different viewpoints concerns milk, which is typically consumed as pasteurized, because raw milk can pose a serious health risk. Typically, fresh milk refers to a packaged that is pasteurized, but otherwise unprocessed (Manfredi et al., 2015). It has been a well-known fact for a long time as for example Burks (1911) warned over one hundred year ago that "unwholesome or dangerous milk may present exactly the same appearance as the purest and safest supply obtainable". There is also a group of consumers considering only raw milk as superior due to zero-processing, but for expert it poses a serious health risk (LeJeune & Rajala-Schultz, 2009). Experts consider that milk does not lose its freshness until it goes sour. Evidently, from the expert perspective safety is the key attribute that is a necessary requirement for freshness. For most consumers, the concepts of fresh and safe are not synonyms, and therefore simply leaning on the expert view does not cover freshness completely, but it needs to be expanded to the consumer view.

2.3.3 Consumer view on freshness

Freshness is a commonly used by marketers as a symbol of a delicious quality that will appeal to consumers. DEL MONTE had already begun to advertised the “natural freshness” of canned fruit a century ago (Unknown, 1919). Péneau (2005) postulated that the consumers’ perception or understanding of freshness is the one that is relevant. Consumers often evaluate freshness as being one of the most important properties of food (Torjusen et al. 2001; Dinnella et al., 2014), but it is also product dependent. According to the study by Lennernäs et al. (1997), quality or freshness is the most important factor contributing to food choice in the European market. In the retail sector particularly, appealing fresh fruits and vegetables are one of the few product categories that have the ability to lure customer from competitors (Fearne & Hughes, 1999). The importance of freshness to the quality perception of consumers has a long-standing position. During the time before refrigerators, food was stored in iceboxes where blocks of ice kept it cool (Cummings, 1949). At that time, producers of “natural” ice (harvested from cold regions and transported to the consumers) were already claiming that the so called “artificial” ice (made using early freezing machines using compressed air) did not have similar effect on preserving food quality (Unknown, 1915). Thus the connection between fresh and natural was already made in the early 20th century with ice: although this may not be the product where freshness is relevant for consumers today.

Cardello and Schutz (2003) inferred that freshness is usually attached to raw or natural products. The fresh product is assumed to be as close to the original state as possible especially considering the physical properties such as appearance. Consumers relate freshness to being healthy and natural (Zhang et al. 2016), and consider it a token of quality and healthiness (Perez-Cueto et al. 2017); consumers prefer fresh foods in order to fight disease and to lose weight (Nielsen, 2015b). It is also a personally formed concept that may not be stable among all consumers. For meat freshness is also the most important intrinsic cue for product safety (Becker, 1999) inferring that freshness is used as a cue for non-contaminated food. There appear to be consumer clusters where at one end freshness is evaluated based on the information about the product and at the opposite end, a cluster who lean solely on the sensory properties (Dinnella et al., 2014). The relevant types of information on freshness perception are for example shelf-life and expiry dates (Ragaert et al., 2004; Zhang et al., 2016).

Consumers may be confused by vague information about the product origin and freshness. When fruits and vegetables are imported, they are typically perceived as fresh even though they have travelled thousands of kilometers. In the case of fruits, they are typically industrially ripened on a large-scale to achieve the best possible eating quality. For consumers, the role of technology may impose a conflict, when desiring natural and fresh fruits. For example, in

the fruit context the technology-assisted freshness may not be relevant as this is the only possibility to enable the supply of fresh fruits in countries where tropical fruits are not grown. Technology has an important role in the extension of shelf-life and retention of fresh-like qualities, but the benefits are not equally appreciated. Individuals with higher food knowledge are more willing to accept these technologies, but individuals with an interest towards sustainability more often reject technology (Cavaliere & Ventura, 2018). This type of behavior is slightly illogical as the use of technology is enabling sustainability and the large-scale fresh food supply chain without technology or novel methods is a paradox. By the end of the 19th century, preserved products were considered to have lost their natural state as the word natural was used to refer to perishability (Stanziani, 2008). On the other hand, the aforementioned invention by Appert enabled canned freshness independent of time or proximity. The conceptions of freshness have evolved during the past centuries and it may be relational to the particular moment in time.

Specific sensory characteristics for one product describing freshness may be different for another (Heenan et al., 2009). Consumers usually link freshness to food, especially to fruits and vegetables (Péneau et al., 2009a), which is often based on appearance (Kader, 1999), but there are also many exceptions. Color has been used as a maturity index for some fruits and vegetables. For strawberries their appearance is the most important characteristic but for carrots textural properties have similar importance to appearance (Péneau et al., 2007a). Nevertheless, according to Fenko et al. (2009) the dominant sensory property is product dependent and smell seemed to override visibly perceived properties if freshness is the relevant property of the product. These are just examples of the diversity of the relevant properties for freshness perception and the product-dependency. When consumers evaluated the quality of minimally processed lettuce, they were stricter towards cut lettuce than they were when evaluating whole lettuce leaves (Ares et al., 2008). This may be due to the fact that cut lettuce has already lost its original properties indicating diminished freshness.

In the consumer context, the freshness conception is affected by demographics. In a study by Péneau et al. (2007b) female participants placed more emphasis on the sensory attributes of apple freshness than male, but the age of the participants did not induce a significant effect. There seem to exist different consumer clusters with very different preferences or notions considering product freshness. Zhang et al. (2016) found that for information-driven consumers, sensory properties were not important and that the opposite group was mainly interested in the physical product properties. Freshness seem to be to a great extent also a subjective matter and the conception of fresh properties varies across different consumer groups. Cardello and Schutz (2003) showed that the conception of freshness also differ among soldiers and civilians.

Freshness may have other factors beyond sensed properties that affect the experienced quality. At the physiological level the freshness perception may be linked to relieving unpleasant symptoms such as lowering excessive body temperature by drinking a cold beverage (Roque et al., 2018). Consumers make constant tradeoffs between emotional and sensory aspects of freshness. In a study by Lund et al. (2006), people tended to prefer recently harvested apples over storage ones, and even the older apples were evaluated as tastier. According to Péneau et al. (2009), consumers being in contact with the production of vegetables and fruits, consider non-sensory properties as being more important and those with lesser contact place more emphasis on sensory properties. To appeal to both of these consumer segments, sufficient information about the product should be provided. It can also be inferred that freshness is a property that partly originates from personal experiences (Roque et al., 2018). Freshness has also some connotations which are not directly linked to the physical properties of food. Gvili et al. (2015) found that food with implied motion, in this case orange juice, increases the freshness perception. They suggested that this may be due to the primitive link between motion and freshness in the natural context. Consumers also tend to show distrust towards packaged and frozen products, because they suspect the product has lost its freshness (Behrens *et al.* 2010). The effect of personal values in relation to geographical origin will now be studied further, and whether personal values are connected to knowledge-based freshness.

2.4 The origin of food

The origin of food is an important attribute when consumers are making their food choices or grocery shopping. It symbolizes many aspects of food such as the overall quality, taste, and safety. Usually people tend to be attracted to the products produced or manufactured closer to the place of consumption (Fernqvist & Ekelund, 2014). National products are rated better than imported, and local better than national (Chambers et al., 2007). This may be partly explained by ethnocentrism, where one's own culture or ingroup is considered as being superior compared to the others (Pettigrew, 2005). Motivation to buy domestic or local products may be to a great extent due to economic nationalism where people are willing to support their home region (Henchion & McIntyre, 2000). Consumers use the country of origin to predict eating quality and the level of safety (Becker et al., 2000). Older consumers especially, seem to prefer products with closer product origin (Miroso & Lawson, 2012). By demanding food from known sources, the consumers want to reconnect with the food system, as the distant global supply chains are not trusted as they seem lack control (O'Hara & Stagl, 2001).

A review by Fernqvist and Ekelund (2014) suggested that signaling the origin of food will raise expectations towards the product and liking has a tendency to move towards these expectations. According to Lobb and Mazzocchi (2007), in many cases domesticity acts as a cue for food safety which raises demand for domestically produced food. There is still a lack of a generally accepted definition of local in the food consumption context. Despite the lack of consensus, locality is used as a symbol for several food properties that are often agreed upon among stakeholders. The origin of food may serve as a proxy for safety, fairness, tradition, and taste (Lusk & Briggeman, 2009). Finnish consumers often seem to consider buying food from a foreign origin as a morally wrong choice (Mäkineniemi et al., 2011). The origin of food can be linked to the country of origin, a specific farm, or even to a type of processing, but the present study particularly concentrates on local origin and its relationship to the perception of freshness.

2.4.1 Local food

The Oxford Dictionary (2018) defines local as ‘relating or restricted to a particular area or one’s neighborhood’. People tend to conceptualize the term local using administrative boundaries or geographical measurements such as towns, counties, or states (Ostrom, 2006). Even the range of transportation is a key factor in defining local, although an exact shipping distance is less important than more vague terms like ‘around here’ or political boundaries (Telligman et al., 2017). The term local obviously refers to the distance traveled or the number of logistic steps and it is typically related to the proximity of the buyer and the place of production. However, this seems rather arbitrary as a means of measurement. Is there a maximum distance or number of steps that is still considered acceptable? When the number of steps is low, the term short food supply chain (SFSC) is typically used. Marsden et al. (2000) defines SFSC as not being solely the transportation distance, but the consumer receiving information embedded in the product, which differentiates the product from anonymous commodities. Actually, local production is not bound only to a certain area or region, but it is production by using specific techniques, which have ties to traditional methods (Fernández-Ferrín et al. 2018). Due to the shorter distances, locally produced food is often considered as an environmentally responsible choice (Pirog, 2004).

Local products are often perceived as tastier, fresher, more nutritious than other products which justifies a possible higher price (Campbell et al., 2014; Chambers et al., 2007). Similar results were found by Roininen et al. (2006) as in their study local production was attached to supporting the local economy, shorter transportation distance, freshness, and trustworthiness. This infers that local food also has a physical presentation linked to several properties, but in

reality, these qualities are in fact based on the expectations of these properties. The effect of locality as an extrinsic quality cue is stronger when more precision is used to describe the production's location (Stefani et al., 2006). The majority of U.S. consumers think that local products come from family farms (Pirog, 2004), which are the purest form in the supply chain of fresh food. The products bought locally are typically referred to as fresh, good quality, and tasty, but also desired as being safe products and demonstrating a distrust towards the retail sector (Holloway & Kneafsey, 2000). Murdoch et al. (2000) describes food quality as being the level of locality and naturalness in the supply chain, which is induced by the desire of consumers to take control over food chains. They also assert that personal knowledge about the product and trusted relationships with local producers are elements of food quality.

Local food networks or supply chains are typically seen as more natural as well as trusted, which probably generates the connotation with increased food safety (Murdoch et al., 2000), and health as well (Penney & Prior, 2014). All the different aspects and attributes linked to the conception of locality and local food were covered by an extensive review of recent academic literature (Table 3). The information provided about a product appeals to the emotions and evidently to the values of consumer if they are in line with these qualities. Local production is associated with production close to the place of residence with minimal preservation, processing, or storage (Ostrom, 2006). This is very close to being equivalent to the definition of freshness, where food should be in the closest possible form to the original state. A study by Migliore et al. (2015) suggested that the quality perception of a short food supply chain is associated with such things as direct interaction with the farmer (details about production and traditions), ethics and social sustainability, as well as trust formed by frequent contact with the producer. Among animal welfare and fair prices to farmers, regional production is considered as being one of the most important ethical attributes in relation to food (Zander & Hamm, 2010).

Table 3. Summary of the conceptions and properties linked to the local food

Properties	Reference
Distance or time from consumer	Ostrom (2006), Roininen et al. (2006), Pirog (2003), Telligman et al. (2017), Feldmann & Hamm (2015), Grebitus et al. (2013), Kneafsey et al. (2013), Martinez et al. (2010), Darby et al. (2008)
Eating quality, overall quality, tastier, better, higher value	Becker et al. (2000), Ostrom (2006), Penney & Prior (2014), Roininen et al. (2006), Webber & Dollahite (2008), Fernqvist & Ekelung (2014), Bratanova et al. (2015), Inwood et al. (2009), Murdoch et al. (2000), Campbell et al. (2014), Motta & Sharma (2016)
Freshness/fresher	Darby et al. (2008), Delind (2006), Miroso & Lawson (2012), Ostrom (2006), Penney & Prior (2014), Roininen et al. (2006), Pirog (2003), Webber & Dollahite (2008), Jang et al. (2011)
More nutritious	Delind (2006), Ostrom (2006), Thomas & McIntosh (2013)
Unprocessed, natural	Miroso & Lawson (2012), Bellows et al. (2010), Jang et al. (2011)
Healthier	Ostrom (2006), Penney & Prior (2014), Pirog (2004), Telligman et al. (2017), Thomas & McIntosh (2013), Webber & Dollahite (2008), Motta & Sharma (2016)
Safety/safe	Becker et al. (2000), Telligman et al. (2017), Webber & Dollahite (2008)
Pesticide free, purer, natural, animal well-being	Ostrom (2006), Roininen et al. (2006), Telligman et al. (2017), Webber & Dollahite (2008)
Supporting local farmers/economy	Chambers et al. (2007), Migliore et al. (2015), Ostrom (2006), Roininen et al. (2006), Pirog (2003), Pirog (2004), Webber & Dollathite (2008), Carpio & Isingildina-Massa (2009), Motta & Sharma (2016), Toler et al. (2009)
Ethnocentrism	Fernández-Ferrín & Bande-Vilela (2013), Fernández-Ferrín et al. (2017), Aprile et al. (2016)
Trust, reputation, reliability, direct contact with farmers/production, traceability	Migliore et al. (2015), O'hara & Stagl (2001), Ostrom (2006), Roininen et al. (2006), Thomas & McIntosh (2013), Kneafsey et al. (2013), Martinez et al. (2010)
Ethics/ethical, morality, and social sustainability (fairness)	Migiliore et al. (2015), Miroso & Lawson (2012), Mäkinieniemi et al. (2011), Thomas & McIntosh (2013), Bratanova et al. (2015), Grunert et al. (2014), Toler et al. (2009)
Environmentally and climate friendly, sustainable	Mäkinieniemi & Vainio (2013), Pirog (2004), Grunert et al. (2014)
Small scale/family farms	Ostrom (2006), Pirog (2003), Martinez et al. (2010)
Traditional	Telligman et al. (2017), Zander & Hamm (2010), Fernández-Ferrín et al. 2017

2.4.2 Can locality serve as a knowledge-based dimension of freshness?

Due to globalization, the temporal and physical proximity of food is constantly increasing and the raw materials transported across the world have become a stable part of our daily diet. Due to this type of development, it may be difficult to source fresh and locally produced food anymore. With today's knowledge and industrial practices, the products are typically safe to consume independent from the production location. In addition to safety, there are other values that require some attention. Globalization increases the range of products available, but at the same time the number of unprocessed or non-preserved products is becoming scarce. If no information about the origin is available, consumers' ability to make informed decisions about the freshness deteriorates. The availability of information about product freshness (origin, harvesting, processing) would enable consumers to use his/hers own judgment and apply personal values to food choices. Comprehensive studies have shown that additional information can raise expectations and also significantly alter the experienced properties (Piqueras-Fiszman & Spence, 2015).

The locality of the product or local food is not something that can be verified based on the physical properties. These factors are considered to possess several appealing properties which may or may not be based on absolute facts. Both time and location dimension are essential parts of freshness perception (Péneau et al., 2009; Fonte, 2008). This is actually close to the conception and significance of local food. The key drivers for purchasing local foods seem to be health, better quality in general, and the elusive freshness (Penney & Prior, 2014). The intrinsic quality cues attached to local origin are either direct or indirect links to freshness as it is described i.e., retaining the original qualities as closely as possible. In a study by Webber & Dollahite (2008) respondents believed that local produce would remain fresher due to the shorter travelling distance, suffer from fewer bruises, be less likely to spoil, and contain fewer chemicals. This was especially true when products were bought directly from the local farmers, it was seen as a guarantee of freshness (Vannoppen et al., 2002). Consumers who frequently buy fruits and vegetables directly from farmers or market places more often use non-sensorial cues, especially location, to describe freshness (Péneau et al., 2009). The product information modifies the subjective nature of freshness as the objective aspect is more dependent on the physically perceived sensory properties. This indicates that there is actually a knowledge-based dimension to freshness and it is affected by personal preferences which then again may be formed via personal values.

Technology enables the retention of fresh-like qualities longer than before. Because of this, more information about both spatial and temporal proximity is needed when the decision about the level of freshness is made. When consumers are evaluating the safety of meat, freshness is the most important intrinsic

attribute and country of origin the most important extrinsic credence quality attribute (Becker et al., 2000), with freshness being the main reason for buying local products (Pirog, 2003). There seems to be some evidence that freshness and origin are connected, but the extent of this connection cannot be confirmed. The consumer may gain some additional information about local products such as farm size or farming practices, which also turn into expectations. The expectations are then individually modified depending on the personal values/attitudes and prior knowledge and experiences. These expectations are typically positive product attributes, which are described in Table 3. Eventually, these attributes either partially or with a full spectrum will create a personal concept of local food. The overall freshness then constitutes the physical properties and extrinsic information cues. Freshness and locality in the food consumption context may on some occasions describe the same phenomenon, where freshness infers more the physical characteristics and freshness information as the locality provides a view from another angle that is from the emotional and expectation perspectives.

Consumers tend to be drawn to local products due to the assumption of many desirable qualities such as superior freshness or taste. Similar processes may occur when knowledge-based freshness modifies the experienced properties towards expected freshness. If the prior assumption about the overlap of freshness and locality is correct, both of these concepts add similar value to the consumer experience. Therefore, in this case, the product origin is hypothesized as describing the closeness to the original product, which may be considered as the perception of freshness. The additional information about food, may not be equally important to all the consumers. People have a tendency to make decisions either based on rational thinking or conversely on intuition. Individuals relying on rational use logical thinking and evidence-based reasoning, while the opposite group relies more on personal experiences and affective thinking (Epstein et al., 1996). These so called experiential thinkers may then be concentrating on the sensed properties rather than the knowledge-based facts.

2.5 Concluding remarks

As discussed in the literature review, the conception of local is based on expectations about product quality, which are, at the individual level, dependent on values and prior experiences (Figure 3). The freshness experience is very similar to the concept of local food, but instead of expectations alone, it has both sensory and knowledge-based aspects, where values, prior experiences, and the sensory capabilities of an individual consumer play a role (Figure 4). Consumers may prefer one aspect over another, but the overall conception is a holistic entity including all of these factors. The concepts of freshness and locality clearly have

many similarities, and the local origin may represent the information side of freshness or at least be part of it. The conception of local food does not have a standard or precise physical presentation. The product attributes of local products are based only on expectations, but it is not necessarily equivalent to the conception of freshness. When the concept of freshness is comprehended more thoroughly, the complexity of the concept can be clarified. The effect of information and the role of locality in the freshness conception will be studied further. Similar to food quality, the freshness experience is a diverse system requiring truly multidisciplinary approaches to provide new input on the subject.

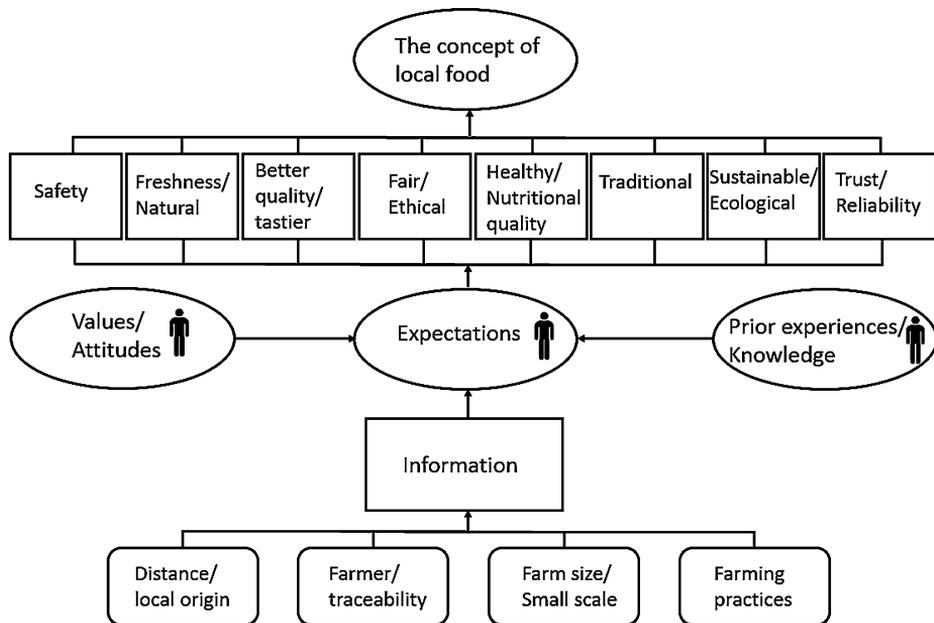


Figure 3. The concept of local food based on the literary search on consumer expectations

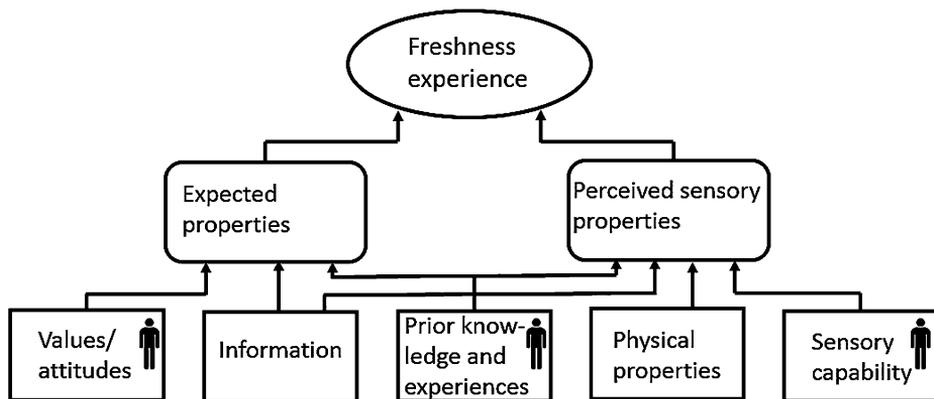


Figure 4. The pathway to the freshness experience

3 AIMS OF THE STUDY

3.1 Overall aim

Freshness and local origin are frequently used in consumer as well as academic contexts, but the definitions of the terms vary according to the group in question. The overall aim of the thesis was to study freshness and locality as value-adding factors in the food consumption context and to study the link, similarities, and differences between these concepts. Freshness and local food are often referred to as desirable, but the true appeal to the consumers requires further studies. The literature review concentrated on constructing comprehensive models about freshness and local food. The experimental part was aimed at studying certain elements of these concepts which were identified as important: the role of sensory properties on the freshness experience (fresh and cooked) and the effect of information about food origin on the experienced quality. The findings should contribute to understanding the link between personal values and product origin in order to obtain a more comprehensive view of the individual differences on the conception of local food.

3.2 Sub-aims

1. To study the role of the sensory properties of fresh components as regards positive or negative perceptions in both, cooked and fresh food. (Publications I and II)
2. To study the effect of the closer origin of food on the experienced product perception. (Publication III)
3. To study the effect personal values on consumption preferences in relation to the origin of food. (Publication IV)

4 MATERIALS AND METHODS

The data for the thesis has been gathered during two separate research projects: Maximizing Freshness/Tuoreuden maksimointi (660/31/2013) and New Processes for Food Industry/Elintarviketalouden uudet prosessit (4578/31/2014). The first project concentrated on understanding the concept of freshness and consumer value as well as to identify the methodologies and technologies enabling the retention of freshness. The second project examined the possibilities to find new business opportunities in the food sector by satisfying consumer demands based on their personal values such as social responsibility and local origin. The projects were mainly funded by Business Finland (former Tekes – the Finnish Funding Agency for Technology and Innovation).

4.1 Consumer tests

4.1.1 Participants (I-IV)

All the publications I - IV included consumer testing (Table 4). For Study I and II, the participants were recruited from two separate restaurants in the region of South Ostrobothnia, Finland. The data collection was executed during spring 2014. The restaurants were located in two separate towns: the larger had ca. 60000 inhabitants and smaller ca. 14000. Both restaurants were part of an international restaurant chain focusing mainly on Scandinavian markets. For the first study, 238 consumers were recruited and for the second 205 consumers. For the third and fourth publications, the same data set was used with altogether 1491 consumers. The consumers were recruited from a university (630 participants) and two secondary level schools, lower (7th-9th grades) and upper (10th-12th grades). The data for the university students was collected during autumn 2015 and for the secondary level schools during spring 2016. The studies conducted at the university and schools were approved by the Ethics Committee of the University of Turku (8/2016).

Table 4. Objectives, sample types and participants of studies I – IV

Study	Objectives	Samples	Participants
I	To study the consumer responses to differences in lettuce freshness. Also the effect of visible salad preparation was studied.	Minimally processed lettuce Fresh-cut lettuce (restaurant) Fresh-cut lettuce (kitchen)	N = 238 (consumers, F 65.1 %, M 34.9 %), Av. age 47.7 (11.5)
II	To study the role of sensory properties of fresh components in overall dish perception of the cooked product.	1) fresh fish/fresh vegetables 2) fresh fish/frozen vegetables 3) frozen fish/fresh vegetables 4) frozen fish/frozen vegetables	N = 8 (trained panel) N = 17 (expert panel) N = 205 (consumers, F 67.3 %, M 32.2 %), Av. age 46.0 (12.2)
III - IV	To study if the closer geographical origin of food induces positive responses among young consumers and if it is product or age dependent. Also the relation between personal value orientations and product origin was studied.	Written description of three product origins (neutral, domestic, local) with three-types of products: vegetables, bread, and meat.	N = 1491 (consumers, F 54.5 %, M 45.0 %), Av. Age 19.0

4.1.2 Food samples (I-IV)

Two types of edible food samples were used in the studies: lettuce (I) and fish soup (II). All the products used in the studies were commercially available and are typically used in the foodservice industry. The control sample for lettuce was minimally processed lettuce, which was typically used in the restaurant; this was then compared to two different freshly prepared lettuce samples. The only difference between the fresh samples was that the first one was prepared in the restaurant kitchen and the second one in the dining area, where the customers could visibly see the lettuce preparation.

For the fish soup samples a so called modular dish design was used. The modularity refers to a production method where products are deconstructed into components, which can be assembled and reconfigured in different combinations. It is considered a tool for mass-customization aiming to produce large volumes of individualized products (Pine, 1993). The freshness of the fish and vegetable mix components were varied to compose four different soup samples (Table 5). All the four samples were used in the sensory characteristics section, but the soup with only fresh components was excluded from the consumer study.

Table 5. The description of fish soup samples

Soup	Description
1	Fresh fish, fresh vegetables
2	Fresh fish, frozen vegetables
3	Frozen fish, fresh vegetables
4	Frozen fish, frozen vegetables

In Studies III and IV, three types of non-edible products were used, where the participants evaluated the products based only on the written description about the product origin (Table 6). Three types of product types with similarly varied origin were used: salad buffet, bread, and meat, where the salad buffet is used here as an example.

Table 6. The description of different types of product origin in Study III and IV

Type of origin	Description
Neutral	The lunch serving includes a salad buffet.
Domestic	The lunch serving includes a salad buffet where all the ingredients are domestically grown (in Finland).
Local	The lunch serving includes a salad buffet where all the ingredients are locally grown.*

*The names of the towns where the vegetables had been grown were included in the description of the local condition (maximum distance ~15 - 25 miles)

4.1.3 Hedonic scales (I-IV)

In studies I and II, the consumers evaluated the pleasantness of the lettuce attributes (appearance, color, taste, and texture) and fish soup (appearance, smell, taste, fish texture, vegetable texture) on a 5-point structured and labelled scale (from 1 = very unpleasant to 5 = very pleasant). In addition, consumers had the possibility to freely comment on the quality of the lettuce. In studies III and IV, consumers evaluated the pleasantness (from 1 = extremely unpleasant to 7 = extremely pleasant), probability to choose (from 1 = highly probable to 7 = highly improbable), and overall quality (from 1 = extremely low quality to 7 = extremely high quality) on a 7-point structured and labelled scale. In addition, the willingness to pay was studied using a scale from - 50 % to + 50 % in reference to the current price.

4.1.4 Value survey (IV)

The short Schwartz's Value Survey was used in Study IV. The short 10-item version of the survey gave the name of the each value and the description of the value items. Each value was rated on a 9-point scale (0 = opposed to my

principles, 1 = not important, 4 = important, 8 = of supreme importance). The weighted average of the main value dimensions was calculated using a method developed by Lindeman and Verkasalo (2005).

4.1.5 Content analysis (I)

To analyze the open-ended comments on the quality of lettuce, content analysis was applied (Elo & Kyngäs, 2008). All the answers were classified into categories. The categories were merged in case of similar contents into higher order headings and named with descriptive names. After this, each comment was analyzed individually to see if one or more of the categories fit. To analyze the quality of the test samples in each category created, the comments were dichotomized into either negative or positive. The content analysis was done individually by three persons to reduce the deviation and the results of the parallel analysis were merged into one.

4.2 Analytical methods

4.2.1 Color measurement (I)

In Study I, the equipment used for the color measurements were as follows: a digital camera (Go – 5, QimagingLtd) with a zoom lens (Computar M6Z 1212-3S), adjustable stand (Kaiser RSX, *Kaiser Fototechnik GmbH*), and for image analysis (Image Pro Plus 7.0, Media Cybernetics) with plugin programs (“Color Lab” and calibration macros by Cheos Co.). L^* (lightness), a^* (redness) and b^* (yellowness) (CIE $L^*a^*b^*$) were measured and the parameters were converted to chroma $(a^2 + b^2)^{1/2}$.

4.2.2 Texture analysis (I)

In Study I, the texture of the iceberg lettuce was analyzed using a TA-XT2 texture analyzer (Stable Micro Systems Ltd., Godalming, UK) with a 5 kg load cell. The tests were done as puncture tests with a 2mm probe (P/2) and the speed setting for the experiment was 1 mm/s. The texture was assessed by maximum load (N) and break energy (mJ).

4.2.3 Sensory characteristics

The sensory characteristics of the fish soup was conducted in two steps (II). The first session was conducted in the analytical sensory laboratory at the University of Turku (Functional Foods Forum), which was designed according to the ISO

8589 standard. All the assessors participating in the session had more than 10 years' experience in quantitative sensory profiling and descriptive methods. The samples used during the session were commercially available fish soups from a Finnish food store and the soups were served cooked and warm. The assessors ($n = 8$, females) created a list of attributes consisting of sensory properties of the fish soup samples (flavor, smell, structure, and appearance). All the perceived properties were collected, and discussed before selecting the final list of descriptors/attributes, which were grouped into categories according to the sensory modality (odor, appearance, structure, and flavor). Altogether 72 descriptors were found, which were grouped according to the sensory modality into four categories: odor, appearance, structure, and flavor (Table 7).

In the next step, a sensory panel evaluated the fish soup samples. Each soup was served to each participant individually. The panel ($n = 17$) consisted of employees of a foodservice company participating on a regular basis in different in-house testing. The samples were served to the participants one at a time. The difference between samples were studied using a modified check-all-that-apply (CATA), where the panelists were provided with a list of descriptors created in the first step, and they were instructed to select all the descriptors that applied to the product (Ares et al., 2014).

Table 7. The descriptors used by the sensory panel

Odor	Appearance	Structure	Flavor
1 O none	20 A red	38 S smooth	54 F none
2 O mild	21 A grey	39 S solid	55 F mild
3 O strong	22 A yellow	40 S flaky	56 F strong
4 O green	23 A green	41 S mashed	57 F sweet
5 O grass	24 A pale	42 S crispy	58 F salty
6 O dill	25 A murky	43 S dry	59 F sour
7 O fishharbour	26 A bright	44 S sediment	60 F bitter
8 O rawfish	27 A pasty	45 S slimy	61 F umami
9 O leather	28 A colorless	46 S separated	62 F fishharbour
10 O sea	29 A smashed	47 S hard	63 F rancid
11 O seaweed	30 A solid	48 S muscular	64 F fresh
12 O fatty	31 A sediment	49 S sloppy	65 F artificial
13 O oil	32 A even	50 S even	66 F veggie
14 O rancid	33 A uneven	51 S uneven	67 F fat
15 O veggie	34 A fibrous	52 S tattered	68 F leather
16 O onion	35 A strips	53 S rubbery	69 F watery
17 O fusty	36 A cube		
18 O sweet	37 A home		
19 O Off-odor			

Statistical analysis (I-IV)

All the statistical analysis were done using the IBM SPSS Statistics (version 22 and 23) and Unscrambler X (version 10.3, Camo Software, Oslo, Norway). All the statistical analysis used during the studies and their purpose of use are described in Table 8.

Table 8. All the statistical analysis used and the purpose

Method	Purpose
Kruskal-Wallis one-way analysis of variance	To test the differences between the lettuce samples (I)
Mann-Whitney U test	The pairwise comparisons of the lettuce samples (pleasantness, color, gender, age group) (I)
False Discovery Rate (Benjamini & Hochberg, 1995)	To control for the multiplicity effect in the pairwise comparisons of lettuce samples (I)
Independent samples t-test	The difference between genders in each test condition (III)
Analysis of Variance with a priori planned comparisons	To test the effect of single dish component (II) and to test the effect of a closer product origin on the perceived properties of product (III)
Cohen's d	To test the effect size of the differences between fish soup samples (II)
Pearson's r	To calculate the correlation between measured variables (III) and between test conditions and the main value dimensions (IV)
Cronbach's alpha	To test the internal consistency of the variables (III, IV)
Breusch-Pagan test (Breusch & Pagan, 1979)	To test the heteroskedasticity of the variables (IV)
Ordinal regression analysis	To test the effect of personal values, gender, origin, and education level on the experienced product quality (IV)

5 RESULTS

5.1 The value of freshness for the consumer (I)

In Study I, consumers evaluated the properties of lettuce during a normal lunch serving. The evaluated samples were either minimally processed, ready-to-eat products, or freshly prepared. According to the results, freshly prepared lettuce seemed to have properties which consumers experience as positive based on the sensory properties (Table 9). For the freshly prepared lettuces color and texture were evaluated as being more pleasant than packaged ready-to-eat lettuce. Both taste and appearance showed a slightly similar trend, but the differences were not statistically significant. Making the salad preparation visible to the customers did not induce significant differences. The evaluated quality was at the same level as it was for the lettuce prepared in the kitchen. Some indication was found that male respondents may prefer seeing the lettuce prepared, but this could not be confirmed as the differences were not statistically significant. Compared to males, the female respondent showed higher preference towards lettuce in general as the evaluations were consistently higher in all the test conditions and all the evaluated properties (Table 10).

Table 9. The mean values with standard deviation of product pleasantness evaluations for different lettuce types [n]. The scale used in the study was from 1 to 5.

	Appearance	Color	Taste	Texture
Packaged lettuce	4.07 (0.50) ^a [87]	4.01 (0.54) ^a [87]	4.03 (0.62) ^a [87]	4.04 (0.58) ^a [86]
Fresh lettuce, restaurant cut	4.16 (0.57) ^a [75]	4.23 (0.56) ^b [75]	4.12 (0.57) ^a [75]	4.24 (0.52) ^b [75]
Fresh lettuce, kitchen cut	4.24 (0.65) ^a [76]	4.21 (0.55) ^b [76]	4.18 (0.58) ^a [76]	4.24 (0.63) ^b [75]

Values followed by different letters are significantly different ($p < 0.05$)

Table 10. Gender induced differences between the pleasantness of product properties (SD)

	Appearance		Color		Taste		Texture	
	Male	Female	Male	Female	Male	Female	Male	Female
Packaged lettuce	3.94 (0.51)	4.14 (0.48)	3.81 (0.54)*	4.13 (0.51)*	3.87 (0.72)	4.13 (0.54)	3.84 (0.64)*	4.15 (0.52)*
Fresh lettuce, restaurant cut	4.08 (0.62)	4.20 (0.54)	4.15 (0.61)	4.27 (0.53)	4.12 (0.59)	4.12 (0.56)	4.19 (0.57)	4.27 (0.49)
Fresh lettuce, kitchen cut	4.12 (0.59)	4.30 (0.68)	4.00 (0.49)*	4.32 (0.55)*	3.96 (0.60)*	4.30 (0.54)*	4.00 (0.57)*	4.37 (0.64)*

Pairs with statistically significant differences ($p \leq 0.05$) are marked with *

In addition to the sensory characteristics, there appeared to be physical differences between freshly prepared and packaged/ready-to-eat lettuces (Figure 5). The color differences between the samples, greater a^* and chroma values correlated positively with the increased consumer quality. The texture of the samples also showed differences as the fresh samples required lower break energy (mJ) and maximum load (N) than packaged samples, which may be caused by increase in tissue elasticity.

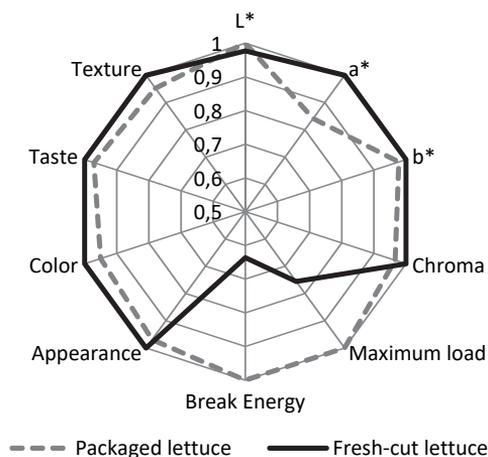


Figure 5. The difference between fresh-cut and packaged samples based on the instrumental measurements and consumer evaluations

It was perceived, especially with open-ended comments that customers tend to satisfy or adjust their demands to the current quality available which was in the test restaurants ready-to-eat lettuce (Figure 6, 7 and 8). When fresh lettuce was offered, the customers tended to react very positively to the changed quality. Both the fresh samples were evaluated more positive than the packaged sample in general in terms of freshness and taste. It seems that better quality is noticed or demanded only after a better product was available. The response towards the fresh produce was actually more positive than with hedonic evaluations. The freshly prepared lettuces were frequently commented on as being fresh and better than usual. With the freshly prepared samples, the improved quality was frequently commented on.

'Today's lettuce was crispy and tasty as it should be every day'.

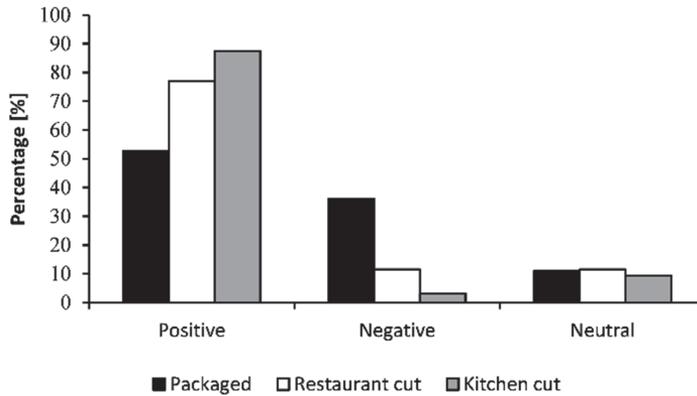


Figure 6. Results from the content analysis (positive, negative, and neutral responses) for each test condition

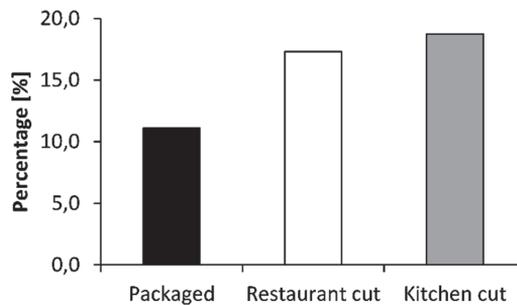


Figure 7. Results from the content analysis of positive responses to the lettuce freshness for each test condition

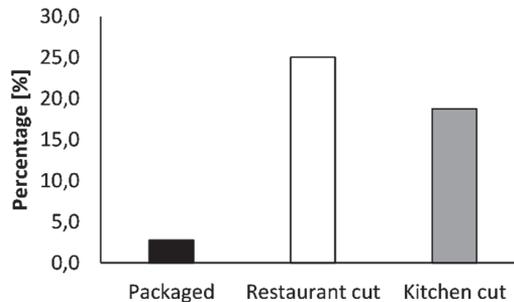


Figure 8. Results the from content analysis of the positive responses to the lettuce taste for each test condition

5.2 The role of sensory properties of fresh components in product perception with cooked product (II)

Altogether, four types of fish soup samples were constructed using fresh and frozen fish and vegetable components. The properties of all four samples were evaluated by a sensory panel and in addition three of the samples were used in the consumer study (the sample with both fresh components were excluded). The

results from the sensory panel showed a clear discrimination of the products when the freshness of the dish components was varied. The data from the check-all-that-apply method (CATA) was analyzed using categorical principal component analysis and the results were grouped according to the modality (odor (O), appearance (A), structure (S) and flavor (F)) (Figure 9). The first principal component (PC1) describing the overall freshness of the product explained 61 % of the variance, which in this case means the level of processing of the soup components. The sample constructed using only fresh ingredients (1) was followed by the soup (2) contained fresh fish and a frozen vegetable mix. Fresh fish seemed to have greater contribution to the overall freshness than the fresh vegetables. The soups with fresh fish were located on the right of the PC1 table inferring that they were experienced differently than the soups with frozen fish.

The second principal component (PC2) explained 25 % of the variance. The interpretation of PC2 is more difficult than PC1. Both soups with fresh fish (1 and 2) were neutral in comparison with the soups with frozen fish, but soup with a fresh vegetables mix (3) had a positive loading on PC2, while soup with frozen vegetables (4) had a strong negative loading. Based on this, PC2 described the freshness of the vegetable mix when frozen fish was used.

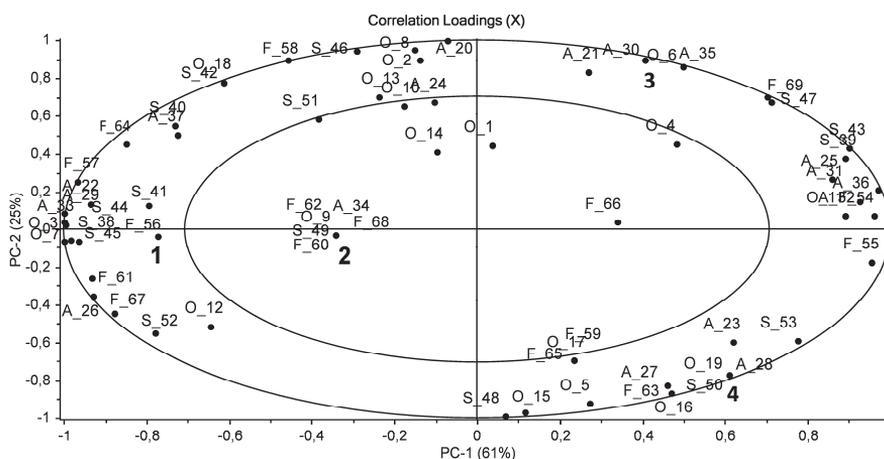


Figure 9. Principal component analysis including all the sensory modalities

The soup samples were clearly discriminated by the consumers, thus verifying the effect perceived by the sensory panel (Table 10). Statistically significant differences were found for all the evaluated soup properties except smell (Table 11). Fresh fish had the greatest effect on the evaluated properties. Fresh fish had the greatest effect on taste and fish texture. There was some indication that the quality of the fresh fish was also reflected the perceived vegetable texture, but the effect could not be verified. The soup with only frozen ingredients was

evaluated worst regarding all the evaluated properties. In addition, fresh vegetables had a positive effect on the evaluated properties, but the effect was not as strong as with the fresh fish. The effect sizes varied from small to large and the greatest effects were found for taste and fish texture, which were induced by fresh fish (Table 11).

Table 10. The average hedonic scores with standard deviations for the fish soup samples (SD) [n]. The scale used in the study was from 1 to 5.

Sample	Description	Appearance	Smell	Taste	Fish texture	Vegetable texture
2	Fresh fish, frozen vegetables	3.99 (0.57) [71]	3.79 (0.66) [70]	4.24 (0.55) [70]	4.17 (0.64) [70]	3.97 (0.61) [71]
3	Frozen fish, fresh vegetables	3.88 (0.74) [69]	3.81 (0.65) [69]	3.98 (0.63) [69]	3.91 (0.84) [68]	4.03 (0.62) [68]
4	Frozen fish, frozen vegetables	3.71 (0.70) [64]	3.68 (0.69) [64]	3.73 (0.70) [63]	3.67 (0.96) [63]	3.81 (0.64) [63]

Table 11. The statistical significance and effect sizes for the planned comparisons (p-value/cohen's d)

Comparison	Appearance	Smell	Taste	Fish texture	Vegetable texture
2 vs. 4	0.017*/ (0.44)	0.342/ (0.16)	<0.0001***/ (0.82)	0.001***/ (0.63)	0.139/ (0.26)
3 vs. 4	0.158/ (0.25)	0.242/ (0.20)	0.037*/ (0.37)	0.130/ (0.27)	0.047*/ (0.35)

The statistically significant differences are marked with * (p < 0.05), ** (p < 0.01), *** (p < 0.001)

5.3 The effect of food origin on the experienced product perception (III)

In Study III, both young adults (university students) and adolescents evaluated product properties based on the written description about the product origin (neutral, domestic, local). According to the results, students at the lower secondary level (7th-9th grades) do not prefer domestic origin over neutral, but both probability to choose and overall quality were evaluated significantly higher for local product (Tables 12 and 14). The evaluated pleasantness of either domestic or local origin did not differ significantly from the neutral. The results among the students at the upper secondary level differed from their younger peers (Table 13 and 14). None of the origins showed any variation among the

evaluated qualities i.e. the product origin did not affect the perceived product properties. The effect of product origin was further studied among both genders to verify whether gender induced any differences.

Table 12. The mean values (SD) of evaluated pleasantness, purchase probability, and overall quality of the vegetables by the lower level students [N].

LOWER LEVEL	Pleasantness	Probability to choose	Overall quality
Neutral	4.93 (1.49) [164]	4.48 (1.82) [164]	4.74 (1.29) [161]
Domestic	4.91 (1.38) [159]	4.80 (1.57) [160]	4.71 (1.34) [160]
Local	5.19 (1.16) [155]	5.05 (1.45) [155]	5.05 (1.34) [154]

Table 13. The mean values (SD) of evaluated pleasantness, purchase probability, and overall quality of the vegetables by the upper level students [N].

UPPER LEVEL	Pleasantness	Probability to choose	Overall quality
Neutral	5.66 (1.25) [131]	5.63 (1.45) [131]	5.53 (0.88) [131]
Domestic	5.57 (1.47) [118]	5.71 (1.43) [119]	5.45 (1.19) [118]
Local	5.59 (1.11) [130]	5.70 (1.19) [130]	5.47 (1.15) [130]

Table 14. ANOVA with a priori planned contrasts in the case of neutral vs. domestic origin (1 vs. 2) and neutral vs. local origin (1 vs. 3) according to education level (LL = lower level, UL = upper level)

	Contrast	Contrast
LL	1vs.2	1vs.3
Pleasantness	-0.02	0.26
Probability to choose	0.32	0.57**
Overall quality	-0.03	0.31*
UL	1vs.2	1vs.3
Pleasantness	-0.09	-0.06
Probability to choose	0.08	0.07
Overall quality	-0.08	-0.06

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

The female students at the lower secondary level (7th-9th grades) had a considerably stronger preference towards vegetables than the male students as the evaluated quality (pleasantness, probability to choose, and overall quality) was significantly higher in the neutral and domestic conditions (Table 15). In the

local test condition, the difference was significant only in the case of probability to choose. Female respondents in this age group did not value either domestic or local origin any higher than the neutral origin. The differences between test conditions were relatively low and the results from the planned comparisons were not significant (Table 17). According to the planned comparisons, the male students did not prefer domestic origin over neutral, but evaluated pleasantness, probability to choose, and overall quality of local product as being significantly better than with the neutral origin. Due to the increased product perception of local products in the male population, the differences between genders disappeared in the case of evaluated pleasantness and overall quality.

Table 15. The mean values (SD) of evaluated pleasantness, purchase probability, and overall quality of the vegetables grouped by gender [N] by the lower level students (7th-9th grades).

VEGETABLES	Pleasantness		Probability to choose		Overall quality	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Neutral	*4.52 (1.59) [84]	*5.42 (1.18) [78]	*3.87 (1.97) [84]	*5.19 (1.33) [78]	*4.46 (1.44) [84]	*5.05 (1.05) [75]
Domestic	*4.57 (1.40) [65]	*5.17 (1.26) [92]	*4.42 (1.65) [65]	*5.10 (1.42) [93]	*4.40 (1.43) [65]	*4.95 (1.21) [93]
Local	5.08 (1.22) [72]	5.28 (1.10) [83]	*4.67 (1.55) [72]	*5.39 (1.28) [83]	4.92 (1.35) [72]	5.17 (1.33) [82]

For each condition the statistically significant differences between genders are marked with * ($p < 0.05$)

Female Students at the upper secondary level (10th-12th grades) had significantly higher probability to choose in each test condition and the evaluated overall quality was higher in the neutral condition (Table 16). The evaluated pleasantness showed no significant differences between genders in any of the test conditions. Both male and female respondents within this group showed no response based on the geographical origin, as the planned comparisons showed no significant differences (Table 17).

Table 16. The mean values (SD) of evaluated pleasantness, purchase probability, and overall quality of the vegetables grouped by gender [N] by the upper level students (10th-12th grades).

VEGETABLES	Pleasantness		Probability to choose		Overall quality	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Neutral	5.46 (1.43) [57]	5.79 (1.07) [73]	*5.23 (1.65) [57]	*5.93 (1.21) [73]	*5.28 (0.88) [57]	*5.71 (0.84) [73]
Domestic	5.30 (1.76) [44]	5.71 (1.24) [73]	*5.36 (1.54) [45]	*5.90 (1.34) [73]	5.39 (1.08) [44]	5.49 (1.26) [73]
Local	5.46 (1.12) [48]	5.68 (1.07) [81]	*5.23 (1.08) [48]	*5.99 (1.17) [81]	5.23 (1.26) [48]	5.60 (1.07) [81]

For each condition the statistically significant differences between genders are marked with * ($p < 0.05$)

Table 17. ANOVA with planned contrasts in the case of neutral vs. domestic origin (1 vs. 2) and neutral vs. local origin (1 vs. 3) according to gender and education level (LL = lower level, UL = upper level)

	Contrast	Contrast		Contrast	Contrast
MALE, LL	1vs.2	1vs.3	FEMALE, LL	1vs.2	1vs.3
Pleasantness	0.05	0.56*	Pleasantness	-0.25	-0.15
Probability to choose	0.55	0.80**	Probability to choose	-0.1	0.19
Overall quality	-0.06	0.45*	Overall quality	-0.11	0.12
MALE, UL	1vs.2	1vs.3	FEMALE, UL	1vs.2	1vs.3
Pleasantness	-0.16	0	Pleasantness	-0.08	-0.12
Probability to choose	0.13	0	Probability to choose	-0.03	0.06
Overall quality	0.11	-0,05	Overall quality	-0.22	-0.11

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

The geographical origin of food seemed to have an effect on the perceived quality of food, but the perception was to some extent dependent on the product type. Among young adults (university students) respondents evaluated both bread and meat products with varying origin. The domestic and local breads were evaluated as being significantly more pleasant, to have higher overall quality, and the probability to choose was significantly higher for local bread (Table 18 and 20). The origin of bread did not have an effect on the willingness to pay. The overall quality of domestic and local meat was evaluated as being significantly better than neutral, as well as the pleasantness and WTP for local product (Table 19 and 20).

Table 18. The mean values (SD) of evaluated pleasantness, purchase probability, overall quality, and willingness-to-pay for bread products [N].

BREAD	Probability to			
	Pleasantness	choose	Overall quality	WTP [%]
Neutral	5.33 (1.14) [107]	5.20 (1.45) [107]	5.19 (1.05) [107]	0.035 (0.14) [107]
Domestic	5.83 (1.01) [106]	5.49 (1.21) [106]	5.78 (1.06) [106]	0.047 (0.15) [106]
Local	6.00 (0.94) [106]	5.59 (1.23) [106]	5.96 (1.10) [106]	0.058 (0.12) [106]

Table 19. The mean values (SD) of evaluated pleasantness, purchase probability, overall quality, and willingness-to-pay for meat products [N].

MEAT	Probability to			
	Pleasantness	choose	Overall quality	WTP [%]
Neutral	5.04 (1.15) [105]	4.92 (1.82) [105]	5.00 (1.15) [105]	0.068 (0.24) [105]
Domestic	5.39 (1.39) [103]	5.18 (1.72) [103]	5.52 (1.01) [103]	0.123 (0.24) [103]
Local	5.59 (1.14) [103]	5.33 (1.64) [103]	5.85 (0.97) [107]	0.151 (0.22) [103]

Table 20. ANOVA with planned contrasts in the case of neutral vs. domestic origin (1 vs. 2) and neutral vs. local origin (1 vs. 3) according to product type

	Contrast	Contrast		Contrast	Contrast
BREAD	1vs.2	1vs.3	MEAT	1vs.2	1vs.3
Pleasantness	0.503**	0.673***	Pleasantness	0.350	0.554**
Probability to choose	0.294	0.398*	Probability to choose	0.251	0.406
Overall quality	0.596***	0.775***	Overall quality	0.524***	0.854***
WTP	0.02	0.05	WTP	0.055	0.083*

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

When the respondents were grouped by gender, the female respondents showed higher preferences in the domestic condition (pleasantness and overall quality) and local condition (overall quality) than male respondents in the case of bread (Table 21). Generally, male respondents did not evaluate domestic product better than neutral, but the local product was evaluated as being significantly more pleasant than the neutral product (Table 23). Female respondents, on the other hand, showed a positive response to both the domestic and local condition. They evaluated the pleasantness and overall quality of domestic and local bread significantly higher than the product with a neutral origin and the willingness to pay for the local product was also significantly higher.

Table 21. The mean values (SD) of evaluated pleasantness, purchase probability, overall quality, and willingness-to-pay for bread products grouped by gender [N].

BREAD		Neutral	Domestic	Local
Pleasantness	MALE	5.43 (0.87) [56]	*5.49 (1.16) [47]	5.90 (0.95) [50]
	FEMALE	5.22 (1.38) [51]	*6.10 (0.78) [59]	6.09 (0.92) [56]
Probability to choose	MALE	5.32 (1.21) [56]	5.32 (1.07) [47]	5.66 (1.21) [50]
	FEMALE	5.06 (1.68) [51]	5.63 (1.30) [59]	5.54 (1.26) [56]
Overall quality	MALE	5.30 (0.99) [56]	*5.53 (1.21) [47]	*5.70 (1.22) [50]
	FEMALE	5.06 (1.10) [51]	*5.98 (0.88) [59]	*6.20 (0.94) [56]
WTP [%]	MALE	5.6 (14.5) [56]	2.5 (15.2) [47]	4.9 (11.3) [50]
	FEMALE	1.3 (14.1) [51]	6.4 (14.9) [59]	6.5 (11.8) [56]

For each condition the statistically significant differences between genders are marked with * ($p < 0.05$)

Male respondents evaluated the pleasantness and probability to choose for meat significantly higher in each of the test condition, but no differences were found in the case of overall quality (Table 22 and 23). Males also evaluated the WTP for domestic and local product significantly higher than females. The increase in evaluated pleasantness and overall quality as well as WTP in both domestic and local conditions were significantly higher for male respondents, but the probability to choose showed no significant differences. Females showed significant increase in the evaluated overall quality in the local condition of meat, but not in any other property or condition.

Table 22. The mean values (SD) of evaluated pleasantness, purchase probability, overall quality, and willingness-to-pay for meat products grouped by gender [N].

MEAT		Neutral	Domestic	Local
Pleasantness	MALE	*5.44 (1.31) [46]	*5.98 (0.85) [50]	*6.04 (0.77) [51]
	FEMALE	*4.73 (1.62) [59]	*4.83 (1.57) [53]	*5.15 (1.27) [52]
Probability to choose	MALE	*5.74 (1.14) [46]	*5.88 (1.12) [50]	*5.92 (0.98) [51]
	FEMALE	*4.29 (1.99) [59]	*4.51 (1.93) [53]	*4.75 (1.76) [52]
Overall quality	MALE	5.02 (1.06) [46]	5.70 (0.81) [50]	5.90 (0.88) [51]
	FEMALE	4.98 (1.23) [59]	5.36 (1.15) [53]	5.81 (1.07) [52]
WTP [%]	MALE	9.4 (25.4) [46]	*19.4 (25.3) [50]	*21.4 (21.6) [51]
	FEMALE	4.8 (22.8) [59]	*5.6 (20.9) [53]	*9.4 (20.6) [52]

For each condition the statistically significant differences between genders are marked with * ($p < 0.05$)

Table 23. ANOVA with planned contrasts in the case of neutral vs. domestic origin (1 vs. 2) and neutral vs. local origin (1 vs. 3) according to gender and product type

	Contrast	Contrast		Contrast	Contrast
MALE, BREAD	1vs.2	1vs.3	FEMALE, BREAD	1vs.2	1vs.3
Pleasantness	0.06	0.47*	Pleasantness	0.89***	0.87***
Probability to choose	0.00	0.34	Probability to choose	0.57	0.48
Overall quality	0.23	0.40	Overall quality	0.92***	1.14***
WTP	-0.03	-0.01	WTP	0.05	0.05*
MALE, MEAT	1vs.2	1vs.3	FEMALE, MEAT	1vs.2	1vs.3
Pleasantness	0.55*	0.60**	Pleasantness	0.10	0.43
Probability to choose	0.14	0.18	Probability to choose	0.22	0.46
Overall quality	0.68***	0.88***	Overall quality	0.38	0.83***
WTP	0.10*	0.12*	WTP	0.01	0.05

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

5.4 The effect of personal values on the origin induced experience (IV)

In Study IV, the same data was used as in Study III, but in addition the personal values of respondents were measured using the short Schwartz's Value Survey. In addition to the evaluated properties (pleasantness, probability to choose, overall quality) a new variable was generated by calculating the mean value of the three scales, which was identified as product perception, showing good internal consistency (Cronbach's alpha 0.827). Among the younger respondents (7th-12th grades), their education level significantly explained the evaluated properties of vegetables (Table 24). The respondents in the lower secondary level (7th-9th grades) systematically evaluated the quality as being lower than the respondents in the upper secondary level (10th-12th grades). Gender also explained the evaluated properties as the female respondents consistently evaluated the vegetable quality as being better than the males. According to the ordinal regression analysis, either domestic or local origin did not significantly predict the product properties. Self-Transcendence explained the evaluated pleasantness, probability to choose, and product perception, but conservation did not explain any of the properties significantly.

Table 24. Odds ratios (OR) of the ordinal regressions predicting pleasantness, probability-to-choose, overall quality, and product perception

Factor/Co-variate	Pleasantness	Probability-to-choose	Overall quality	Product perception
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Conservation	1.15 (0.96-1.37)	1.14 (0.96-1.36)	1.00 (0.84-1.19)	1.10 (0.93-1.30)
Self-transcendence	0.81 (0.68-0.97)*	0.80 (0.67-0.95)*	0.87 (0.73-1.04)	0.80 (0.68-0.95)*
Higher education level	0.42 (0.32-0.54)***	0.32 (0.25-0.42)***	0.37 (0.29-0.49)***	0.33 (0.26-0.43)***
Male gender	1.62 (1.24-2.12)***	2.61 (1.99-3.42)***	1.75 (1.34-2.29)***	2.26 (1.74-2.93)***
Domestic origin	1.06 (0.78-1.44)	0.80 (0.59-1.51)	1.01 (0.74-1.37)	0.93 (0.69-1.25)
Local origin	1.00 (0.74-1.36)	0.76 (0.56-1.02)	0.81 (0.59-1.10)	0.83 (0.62-1.11)
Pseudo R ² (Nagelkerke)	0.095	0.178	0.103	0.158

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

All the variables were transformed. Due to this, high values indicate low endorsement.

According to the correlation table (Table 25), values have an explanatory role in relation to the product origin. In the neutral test condition, the only significant (negative) correlation was found between conservation and probability to choose. In the domestic condition, self-transcendence showed a significant positive correlation with pleasantness, probability to choose, and product perception, but conservation showed no significant correlations. In the local condition, conservation showed significant negative correlations with all the other evaluated properties except overall quality. Self-transcendence then showed significant positive correlations with all the evaluated properties.

Table 25. Correlation coefficients (Pearson's r) between test conditions (neutral, domestic, local) and main value dimensions (conservation and self-transcendence)

		Conservation	Self-Transcendence
Neutral	Pleasantness	-0.071	0.057
	Probability to choose	-0.142*	0.064
	Overall quality	-0.022	0.067
	Product perception	-0.104	0.070
Domestic	Pleasantness	-0.013	0.146*
	Probability to choose	0.013	0.181**
	Overall quality	-0.011	0.075
	Product perception	-0.003	0.153*
Local	Pleasantness	-0.127*	0.157**
	Probability to choose	-0.153*	0.166**
	Overall quality	-0.099	0.124*
	Product perception	-0.150*	0.179**

In addition, for the university students, a new scale called product perception was calculated as a mean value of the three scales. The product perception scale showed good internal consistency for both product types (0.821 for bread and 0.789 for meat). Among university students, gender significantly explained the evaluated properties except the overall quality for the meat product (Table 26). Domestic origin significantly explained the overall quality, and the local origin all the other qualities except the probability to choose. Conservation explained the probability to choose and product perception, but self-transcendence did not predict any of the properties significantly.

Table 26. Odds ratios (OR) of the ordinal regressions predicting pleasantness, probability-to-choose, overall quality, and product perception for meat product

	Pleasantness	Probability-to-choose	Overall quality	Product perception
Factor/Co-variate	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Conservation	0.79 (0.61-1.04)	0.74 (0.57-0.96)*	0.79 (0.61-1.03)	0.74 (0.58-0.95)*
Self-transcendence	1.16 (0.87-1.54)	1.15 (0.87-1.51)	0.88 (0.66-1.16)	1.00 (0.77-1.31)
Male gender	0.31 (0.20-0.49)***	0.28 (0.18-0.43)***	0.85 (0.55-1.32)	0.34 (0.22-0.52)***
Domestic origin	0.63 (0.38-1.05)	0.79 (0.48-1.30)	0.43 (0.26-0.71)**	0.63 (0.39-1.01)
Local origin	0.53 (0.32-0.89)*	0.73 (0.45-1.20)	0.23 (0.13-0.39)***	0.43 (0.27-0.71)**
Pseudo R ² (Nagelkerke)	0.145	0.162	0.123	0.153

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

All the variables were transformed. Due to this, the high values indicate low endorsement.

Conservation did not show any significant correlation in the neutral condition, but self-transcendence did with all the other qualities, except overall quality (Table 27). In the domestic condition self-transcendence did not show significant correlations with any of the properties, but conservation did with all the other, but not probability to choose. In the local test conditions there were no significant correlations.

Table 27. Correlation coefficients (Pearson's r) between test conditions (neutral, domestic, local) and main value dimensions (conservation and self-transcendence) for meat

		Conservation	Self-Transcendence
Neutral	Pleasantness	0.146	-0.202*
	Probability to choose	0.164	-0.313**
	Overall quality	0.012	-0.147
	Product perception	0.135	-0.265**
Domestic	Pleasantness	0.253**	-0.083
	Probability to choose	0.263**	0.033
	Overall quality	0.141	0.161
	Product perception	0.288**	0.019
Local	Pleasantness	0.121	-0.114
	Probability to choose	0.165	-0.104
	Overall quality	0.181	0.117
	Product perception	0.195	-0.062

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

With bread products, gender did not significantly predict the evaluated qualities (Table 28). The domestic condition significantly predicted all the other properties except probability to choose, but the local condition predicted all of them. Neither conservation nor self-transcendence predicted any of the evaluated properties. None of the test conditions showed any significant correlations between the test conditions and value dimensions (Table 29).

Table 28. Odds ratios (OR) of the ordinal regressions predicting pleasantness, probability-to-choose, overall quality, and product perception for bread product

Factor/Co-variate	Pleasantness	Probability-to-choose	Overall quality	Product perception
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Conservation	1.13 (0.86-1.49)	1.00 (0.77-1.31)	0.99 (0.75-1.30)	0.97 (0.75-1.26)
Self-transcendence	0.96 (0.73-1.26)	1.01 (0.77-1.31)	1.05 (0.80-1.37)	1.04 (0.81-1.34)
Male gender	1.52 (1.00-2.32)	1.14 (0.76-1.73)	0.69 (0.46-1.05)	0.74 (0.50-1.11)
Domestic origin	0.42 (0.26-0.70)**	0.72 (0.44-1.17)	2.92 (1.76-4.85)***	2.37 (1.47-3.83)***
Local origin	0.30 (0.18-0.50)***	0.61 (0.37-0.99)*	4.52 (2.69-7.60)***	3.23 (1.99-5.24)***
Pseudo R ² (Nagelkerke)	0.100	0.016	0.129	0.087

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

Pleasantness and probability-to-choose were transformed. Due to this, the high values indicate low endorsement of the transformed variables.

Table 29. Correlation coefficients (Pearson's r) between test conditions (neutral, domestic, local) and main value dimensions (conservation and self-transcendence) for bread

		Conservation	Self-Transcendence
		Neutral	Pleasantness
	Probability to choose	0.051	0.030
	Overall quality	-0.009	0.025
	Product perception	-0.004	0.030
Domestic	Pleasantness	-0.114	-0.048
	Probability to choose	0.017	-0.142
	Overall quality	0.021	-0.090
	Product perception	-0.024	-0.107
Local	Pleasantness	-0.002	0.042
	Probability to choose	-0.068	0.040
	Overall quality	-0.076	0.109
	Product perception	-0.061	0.077

The statistically significant differences are marked with * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

6 DISCUSSION

The results of the study showed that both freshness and locality were value-adding factors in the consumer interface with the respondents in this study. Tentatively, the two topics seem to be rather dissimilar, but they are actually similar constructs without explicit definitions. Both of the terms go far beyond a physical context, as product related information is an essential factor in addition to our personal preferences. The overall aim of the thesis was to study freshness and locality as value-adding factors in the food consumption context. Freshness is related to physical properties, but the properties contributing to freshness are different from product to product, thus making the perceived qualities of freshness product dependent. According to the literature review, the physical properties attached to freshness and local food may be very nearly equal, but their relation to the consumers' personal value orientations may be the differentiating factor. This topic will be discussed further.

6.1 Sensory perspective on freshness, and freshness as a value-adding component in dish

Freshness clearly adds value to a product experience, which consumers perceive based on the product's sensory properties. It is therefore a product attribute companies in the manufacturing and foodservice industries can benefit from in their processes. The results of Studies I and II showed that the effect of freshness is also perceivable in the finished product or cooked dish. Study I, showed that fresh products exhibit qualities which consumers recognize based on the physical properties and which are considered to be more pleasant than a product that has already lost its physical freshness. Although there are many technological means, such as packaging solutions or chemical sanitizers to retain the fresh-like qualities, from the consumer perspective, the tested components were more appealing when served as fresh instead of fresh-like. In the foodservice industry, fresh products may be used as a synonym for the salad buffet. The downside of the technological evolution is that the typically used, minimally processed vegetables may already be processed long before serving, and the sensory perception may not be fresh anymore. Respondents seemed to react more strongly to the loss of fresh-like qualities, when fresh produce was available. This indicates that customers are used to a standard quality where peak freshness has already been lost, and they only noticed the actual difference when a better product is served. Open-ended comments seemed to provide a stronger response than the hedonic scale used in the consumer study. In future studies, further exploitation of qualitative methods might be beneficial. In this case, the decline

in the level of freshness of the lettuce could be measured using color and texture analysis, but the relevant method of measurement is product dependent. Due to this, a clear-cut objective definition is not possible, and the parameters for freshness needs to be set separately according to each product. New methods to evaluate product freshness are constantly being developed such as luminance distribution (Wada et al., 2010) or color measurement (Lee et al., 2013), which show that people have a tendency to choose fresh products based on the visual cues. When objective methods correlating the consumer data are developed, they should be exploited when applicable.

The effect of transparent product preparation on freshness perception could not be verified, as the consumers showed no significant response when seeing the lettuce cut in the restaurant. Kim et al. (2015) observed similar finding about reactions to food cues such as processing, for example, seeing orange juice freshly squeezed does not induce significantly different evaluations, but on the other hand Zhang et al. (2016) indicate that transparent manufacturing of orange juice induces a positive freshness perception. The effect of context on freshness perception may therefore be product dependent, but situation specific as well. The test setting may have caused a measurement bias as the consumers may not have noticed the lettuce processing either due to being rushed or some unknown cognitive factors as the processing was done in an actual commercial restaurant during lunch hour. If the effect of transparent manufacturing or preparation is studied in the future, the procedure needs to be effectively communicated to the consumers.

There were no significant differences between male and female respondents in relation to the lettuce freshness in this study. In a study by Heenan et al. (2009) female and older participants rated the freshness of baked products higher. The set-up in this study differed from the present study, because instead of directly evaluating the product freshness, consumers evaluated certain product properties. Ragaert et al. (2004) showed that older consumers (>36 years) also rated freshness as well as healthiness and nutritional value more important the younger ones. In the study by Jung et al. (2012), men gave higher scores to the least fresh spinach samples, which may infer that freshness is not equally important to men or their conception is, in some cases, different to women, but such effects were not found with the products used in the present study. They also found that the individual experience of the product properties has an effect on the freshness evaluation. Frequent usage or knowledge of the product may affect the importance of freshness (Ragaert et al., 2004). Jung et al. (2012) found that the perception of freshness was different in the United States than in Korea, inferring that results may vary according to culture or country.

The experimental data showed that the fresh and non-fresh components formed combinations where the product perception or freshness of a complete

dish can be incrementally varied and increase the perceived sensory quality. The components were not equally valuable as regards the sensory quality. Fresh fish yielded better evaluations than fresh vegetables. The increased level of quality with a single component also reflected in the other components. In this case, the fresh fish also seemed to increase the pleasantness of the vegetable texture. This is in line with previous studies on the effect of meal combinations on perceived quality (Aaslyng & Frøst 2008; 2010). When applying several components with multiple choices, the flexibility of the raw material usage increases significantly. When raw materials come as readily processed products, the quality may be less than optimal, which in turn is reflected in the final dish. Different processing methods can cause considerable variance in the properties of the final products. By using fresh ingredients, there is a possibility to reduce this variance. The main component of a dish had the greatest impact on the perceived freshness. As in the current study, perceived freshness can increase the meal satisfaction in the foodservice context (Ko, 2009). Even the ready-to-use convenience products may appeal to the foodservice sectors due to cost saving opportunities, using cooking from scratch facilitates customer relationships as well as boosting the eye appeal of portions (Dallinger & Magnini, 2017). The model of using a mixture of fresh and non-fresh components could be applied in the foodservice sector to fortify the level of perceived freshness of complete dishes.

The soup samples were differentiated by all the evaluated product properties (appearance, taste, fish texture, vegetable texture) except smell. Although olfaction has a key role in taste perception (Spence, 2015), and therefore smell may have been contributing to the taste of the soups, it was considered that as the smell was probably not the dominant sensory modality in the case of fish soup, it may not be a discriminant factor in the freshness perception (Fenko et al., 2009). Taste, appearance, fish, and vegetable textures may be more relevant attributes than smell when making the decision about product quality and freshness. Heenan et al. concluded that odor is one component of freshness for baked products, but different sensory characteristics interact giving a single freshness impression. A fusion of taste and odor may occur and the modalities are merged into a single perception (Verhagen & Engelen, 2006). As odor itself was not a very strong factor in the case of fish soup used in this study, it was not by itself able to provide enough information to make the freshness decision. Fish is a highly perishable product, which develops off-flavors and off-odors very quickly, if not handled properly. Before proper refrigeration systems existed, fish had to be consumed locally i.e. as fresh as possible. Because of this freshness is usually referred to as a highly important property of fish and fish products (Brunso et al., 2009), and therefore consumers may be even more sensitive to the fish freshness than they are in many other categories.

Freshness is typically seen as an important property for uncooked or unprocessed product. The results from this study indicate that the effect of freshness can also be perceived in the cooked product, and not only when it is uncooked or in a raw state as is the usual observation. Similar to the current study, the decreased level of freshness in raw fish caused a significant deterioration in the quality of cooked tuna (Miao et al., 2017). Freshness can still be an essential factor when serving cooked meals and therefore the industry and foodservice sector should give more thorough consideration to the quality of their raw materials as the decreased quality is still perceivable in the final products. For this, the foodservice companies should have more tools to balance between customer demands and profitability. Besik & Nagurney (2017) provided a mathematical model using game theory about the deteriorating quality of fresh produce. This type of tool could be useful to both the producer and retail sector to be able to maximize the product quality or freshness and provide the consumers with the freshest possible products as is economically feasible. According to the current results, the perceived freshness of a complete dish can be optimized by carefully selecting the combination of components, which will give the greatest contribution in relation to the raw material prices. This commercial application needs further studies as only one type of product was used.

6.2 The effect of the closer origin of food on the experienced product perception

The product origin, especially if it is closer to the place of consumption, has a significant effect on the perceived product quality, but the effect was dependent on age, gender, and product type. Among adolescents, only boys reacted positively to local origin, but among university students the effect was more consistent. Female respondents preferred a local origin in the case of bread, but for males the origin of meat was more important. The higher preference towards product origin may be linked to the increased interests towards these products in general. The aim in Study III was to test whether product origin induces positive experiences among consumers when the production site moves to a geographical location which is located closer to the place of consumption. If products are not differentiated based on their sensory properties, product perception may be influenced by the expectations created by the information about product properties (Piqueras-Fiszman & Spence, 2015). Locality is frequently discussed in the food context, but there is no universal understanding of what it is constituted of, besides miscellaneous expectations about product quality. The model for the concept of local food introduced in the literature review postulates that it is based on expectations about several product attributes. The expectations

are personally formed, so there may be large variance at the individual level. Despite the different kinds of expectations placed on local products, the overall perception may still be equally positive.

According to the results, both domestic and local origin had positive effects on the evaluated properties, but the effect was not consistent across products, gender, and age. Information about the origin certainly affected consumers and there seem to be incremental differences when the product origin moves closer to the place of consumption. Generally, the offered information about product properties may also have an effect on the perceived sensory quality (Caporale & Monteleone, 2004). Adult populations have been studied more thoroughly, and they seem to respond to the local origin more positively. It is yet unclear if similar behavior can be consistently found among younger consumers. In this study among adolescents, only the boys at the lower secondary level responded positively towards local origin, but not domestic. No effect was found among either of the genders at the upper secondary level or girls at the lower secondary level. This infers that adolescents have a different criteria for food choices than adults. Share & Stewart-Knox (2012) showed that adolescents construct food choice factors like health and convenience differently than adults and also their food choice priorities are different. This may partly explain the differences between adolescents and adults. The conception of local food may be different for younger respondents or it may not be equally important than for adults. According to the study by Robinson-O'Brien et al. (2009), 20.9 % of adolescents considered food being locally grown as somewhat or very important, but there were no differences between genders. The decision-matrix among adolescents is quite complicated, because they also may be using different criteria when meals were eaten either with family or friends (Contento et al., 2006). Only one type of product (salad buffet) was used in this study among young consumers, so the effect may be different with other products.

Study III showed some evidence that the importance of the product origin is different in relation to the product type. The results also showed a clear variation according to gender. Among the adult population (university students) the female respondents favored a domestic and local origin for bread, but for the male respondents it did not have equal importance. Females rated the pleasantness and overall quality of domestic bread significantly better than neutral. The male respondents showed significant preference only for the locally produced bread. Women are more likely to be enthusiastic bread consumers than men, which generally causes them to be more interested in bread properties (Gellynck et al. 2009), which may also explain the importance of bread origin. Traditionally, bread was often a local product, but nowadays frozen bread doughs are used in-store bakeries to bake and serve consumers bread with fresh-like properties. Production location and the freshness of bread may have a link on the

information level, but the sensory properties of fresh bread are more closely attached to the temporal distance of baking. This is an example where consumers may be divided according to their preferences and in some cases values. For some individuals the information about the properties is more important than the actual physical characteristics of the fresh product (Dinnella et al., 2014). Female respondents were willing to pay more for the local bread, but a similar effect was not found among male respondents. Hempel and Hamm (2016) found in their study that even the willingness to pay is typically higher for local products, but more likely if they are completely unprocessed, inferring that consumers are expecting natural quality. Women seem to value the social dimension of buying local, which may also increase the WTP (Gracia et al., 2012).

For the meat product, the preferences were quite different than for the bread. Male respondents evaluated the pleasantness and overall quality of domestic and local products as being significantly higher than the product with a neutral origin. The only significant differences among female respondents were found for the overall quality of local meat. Male respondents were also willing to pay significantly more for domestic and local meats. The product type differentiated the respondents according to the gender. The men had a higher preference towards meat as the women had for bread. Women control meat intake for example due to animal welfare and also for health related reasons (Beardsworth et al., 2002), which probably explains the lower preference in this case. Meat is a product where freshness is highly valued due to safety demands. As meat was a more appealing product to the men and their frequency of use higher, the product origin, therefore, may be more important to them as well. Similarly, women hold bread products more important than men, so more emphasis may be placed on the origin of the bread products.

Product origin is clearly something that can add value to the product, but it cannot be taken as self-evident. By providing consumers with a sense of interaction with the farmer or producer may result in increased interest towards local produce and healthy choices (Berlin et al., 2013). The increased consumption of fruits and vegetables reduces the risk, for example, of coronary heart disease (Boeing et al., 2012), and it can therefore be assumed that the product origin could be applied to increase intake among this group. Health and social-norm based information have shown evidence of increasing the amount of consumed fruits and vegetables (Sharps & Robinson, 2016). In the case of vegetables and fruits, they appear to be competing with other sorts of food groups (Yeh et al., 2010). According to Yeh et al. (2010), among college freshmen they compete against fast foods and snacks which are considered to be more appealing, easier to reach time-wise, and the quality is more consistent. Along with origin, freshness is especially important with regard to fruits and vegetables; by adding value to these products by either sensory, knowledge-based freshness, or sense

of interaction though local origin, the consumption of these products could be increased.

6.3 The effect of product origin in relation to the personal values

Study IV expanded the topic by studying whether values had any significant relationship with the product origin. According to the results, among adolescents, self-transcendence showed a significant positive correlation with domestic and local origins and conservation showed a negative correlation with local origin. Among young adults, the more conservative individuals placed more importance on product origin, but the effect was product dependent. Among adolescents, conservative values predicted a lower preference for local products. This result is somewhat contradictory, because local origin is typically linked to tradition (Fernández-Ferrín et al., 2017), which is a part of the conservative value dimension. As adolescents' conception of the product origin is different than adults, the role of value orientations seem to differ as well. The results showed clear variation according to both, age and product type. The adult respondents showed positive correlations with closer origins and conservation in the case of meat, but they were significant only between domestic products. In the neutral test condition, there were significant negative correlations between the evaluated properties and self-transcendence. This indicates that generally individuals regarding self-transcendence as important, evaluate the meat properties lower. This group is more likely to refrain from eating meat due to moral reasons (Hodson & Earle, 2018; Rosenfeld & Burrow, 2017). However, the difference equalizes when moved to the domestic and local conditions, thus inferring that among this group the closer product origin is also important. The value orientations did not show any significant correlations with bread inferring that bread is a neutral product, which does not necessarily activate values, but other factors carry more weight regarding bread choices.

The study conducted by Teuber et al. (2016) showed that there appear to be different types of consumer clusters with different type of preferences. People have an individual and unique set of values which can predict their choices in life. In the study by Grunert et al. (2014) on peoples' motivation to use sustainable food products, universalism is very often the dominant value, which is part of the self-transcendence value dimension. Cosmina et al. (2016) suggested that a strong preference for local honey could be due to altruistic motives such as supporting the local economy. The same study also found that people frequently buying food directly from farms want to support local or regional economy and universalism is an important value type to them. In addition, individuals endorsing biospheric values gain moral satisfaction when

consuming locally produced products (Bratanova et al., 2015). These studies link the self-transcendence value dimension to local origin in a similar way to that found among adolescents in this study, but product origin was not important to all the respondents. Similarly Bissonnette & Contento (2001) found that locally produced food was not personally important to 80 percent of adolescents. All people do not consider local foods distinctive or special (Campbell et al., 2014). These individuals probably value some other property, which is in line with their values or they do not generally regard food as important.

Even personal values seem to have an explanatory role related to food choices, taste, and price, and convenience, for example, may override the appeal of ethical or environmental factors (Mäkiniemi & Vainio, 2013). Earlier studies have shown that there exists a so called behavioral intention gap meaning that despite the positive attitudes the actual purchase intention is rather low (Vermeir & Verbeke, 2006). Overall, it can be seen from the data that ethical reasons are certainly not important to everyone; the personal preferences of these people probably influence their behavior over societal reasons (Carrigan & Attalla, 2001). Vermeir and Verbeke (2006) found in their study that even attitudes towards sustainable products are negative at a personal level, and that peer pressure explains the intention to buy these products. For conservative individuals tradition and security are important, and the desire to purchase local products may be caused by the expected safety. The willingness to buy or expected quality of local products may not be valued only based on the expected taste or quality indicators, but the variation may be much larger as described in the literature review considering the concept of local food.

According to the results, local food appeals to consumers, but the individual preferences vary. Values have a guiding role in our lives as people use them in decision-making under specific situations (Bardi & Schwartz, 2003). Despite fresh, locally produced vegetables being appealing or activating our values, the near-by supermarket may be still more appealing as all shopping can be done very conveniently at a very low price. Due to this, it is difficult to fully predict any type of behavior at the population level when individual preferences have a great deal of variation. The perceived quality of local products is the capability of the expected properties to produce a positive experience even though the experience is not based on actual physical properties as described earlier in the concept of local food. The local origin is closely attached to a certain place or the proximity between production and consumption, as well as the emotional response generated by the place of production or producer. There is also a hedonistic dimension in local food as it is often expected to be tastier, and a positive response is probably more often produced by moral satisfaction.

6.4 The link between freshness and local food

Locally produced and freshly prepared products are expected to possess many similar qualities. When consumers purchase locally produced product they expect freshness along with other desired attributes. As the closeness of the product can be understood by physical proximity or closeness to the properties of the original product, the information content of freshness and locally produced products may also be similar to each other. Local food is typically attached to a known origin close to the place of consumption inferring a short logistic chain, safe product storage, and minimally processed or not at all. Similar to the conception of local food, a part of freshness is formed via information such as the expiry or production date (Wansink & Wright, 2006). One difference is that consumers cannot verify the product origin empirically, so the expected quality of a local product may be based on emotional aspects, but a fresh product also has a physical presentation differentiating it from non-fresh products.

The overlap between freshness and locality is only partial, and the concept of local food may be more affected by the ethical aspects and sustainability. Ethical food choices have a link with personal values, but the relation of values and freshness has not been thoroughly studied. Vannopen et al. (2002) found that hedonism is strongly linked to good taste and freshness, as these properties have a close connection to pleasure induced by food. In the organic food context freshness is one of the factors contributing to the gained personal benefit, and the other factors like sustainability and animal welfare contribute to the social benefits (Gottschalk & Leistner, 2013). This indicates that freshness is preferred due to hedonistic reasons, but cues more closely attached to ethical conduct are valued for altruistic reasons. In a study by Brunsø et al. (2004), freshness was located in the value domains of benevolence and tradition, which are linked with preference for local food. In the study by Brunsø et al. (2004), the freshness was more closely related to natural quality than increased taste, which is also an indication of the complex nature of freshness.

In the current study, it was found that the information content of freshness and local food are very much alike, however, there are small, yet crucial differences. As local food is also seen to contribute to society and boost the local economy, some of the appeal lies in the opportunity to do good and also retain traditional production methods. Although freshness, along with taste, is the most important attribute for buying local food (Feldmann & Hamm, 2015), there is still an additional dimensions, which is not covered by either sensory or knowledge-based freshness. Advocates for local food want to reconnect with the origins of food and are eager to share their personal values about the food system (Bingen et al., 2011). As inferred in the literature review, the quality is based mainly on expectations about the sensory quality, because local food cannot be standardized. It may be that closer geographical origins appeal to altruistic and

more traditional individuals and the effect is even stronger than the simple appreciation of fresh, and hence, tastier products. More studies are needed on the relation of freshness and value orientations.

Together with taste, freshness is typically considered as an intrinsic quality cue. However, as there is clear evidence that the conception of freshness has an extrinsic dimension, this should be considered in future studies, when freshness is measured in the consumer context. The quality of local food may to some extent to be determined pre-consumption, as consumers who value local food do not revise their beliefs even when negative information is available, but concentrate on the positive aspects (Costanigro et al., 2014). By providing information about the food freshness, it is possible to appeal to the general population preferring good taste and other organoleptic qualities. When adding the local food component to the information-matrix, it could appeal to a smaller population valuing more altruistic and conservative values. This would serve both the customers when choosing the most appealing products and the retail sector by opening up additional markets.

6.5 General discussion

A lobbyist working for the American Fresh Juice Council argued that “Fresh is not a measurement. Fresh is state of being” (U. S. Food and Drug Administration, 2000). Even though his purpose might have been to promote the cause, there may be some truth in it. Freshness is intuitively considered as being the sum of several properties, which makes it difficult to grasp and to measure unambiguously. A decision about freshness may be formed only based on sensed properties, but the overall perception may have additional dimensions. When considered more thoroughly, freshness has a knowledge-based or intellectual side, which is based on the information about the product properties, processing, harvesting, origin, or transportation distance. There may be difficulties in evaluating product freshness based on its properties, but information is unbiased and the concept of freshness is partly formed based on information. Due to this, it is important to understand the different aspects of freshness more thoroughly. Freshness has been recognized as one of the key components when choosing local foods (Penney & Prior, 2014). However, these links have not been properly considered in the common context to take the discourse on these subjects further. The results of this study were gathered during two separate projects. This work concentrated not only on clarifying these concepts, but also on discussing whether a meaningful link exists between them, as well as considering the differences.

As the present study shows, locality and freshness are clearly desired properties, and they can be used to increase the appeal of certain products. The

two phenomena need a more comprehensive understanding to gain advantages in marketing as there are several variables which induce variance such as product type, gender, and personal values. Some people just eat when they are hungry and their food choices are more impulsive (Cheung et al., 2017). For some people it is just the opposite, that is, the information about the properties or production methods are important and their decisions are guided by information cues (Asioli et al., 2017). Both the origin of food and freshness are often considered important especially for fruits and vegetables. As the consumption of fruits and vegetables are well below the recommended level, these characteristics could be used to increase the appeal of these products. In the present study, teenage boys especially seemed to respond positively to the local origin, although this is a typically challenging group. With both freshness and local food, it is potential to really impact on the healthier food choices as well sustainable practices. Mäkineniemi & Vainio (2013) suggested that if consumers would evaluate the holistic freshness, including both sensory and information dimensions, instead just one, the amount of food waste could be reduced. They infer that if consumers had the capability to make a holistic evaluation of whether a product is fresh or safe to consume using both extrinsic and intrinsic cues and not excluding one or the other, the amount of food discarded could be reduced. The complete conception of freshness needs to be clarified to enhance the quality of the discourse between expert and consumer views on freshness. The technical or expert perspective on fresh is dependent on safety, while consumers place the main emphasis on hedonistic appeal. To be able to reduce food waste, the different aspects of freshness should be effectively communicated to the consumers so that they can make more educated judgments on products.

The demand for more transparent manufacturing processes in terms of production methods, raw materials, and sustainability is increasing and in the future probably more information will be openly available to the consumer. As presented in the literature review, people are drawn to fresh or locally produced products due to a wide variety of reasons such as expected sensory quality or safety, willingness to support local farmers and economy, or respect for tradition. Because of this, there is no typical customer for local or fresh products, but only different motives. Attitudes and values can guide decisions, but for example price sensitivity may nevertheless be more important (French, 2003). Consumer ethnocentrism is a strong predictor of the evaluated quality in relation to locally or regionally produced products (Fernández-Ferrín & Bande-Vilela, 2013). Ethnocentrism may increase the motivation to buy local products, but this is to some extent product dependent as in Studies III and IV. The differences with product involvement among consumers may explain the differences between consumers or genders. When the presented models are compared, the constructs are very similar. The concept of local food is created by expectations raised by

additional information. The freshness perception has in addition to information, also perceived sensory properties, which according to Studies I and II have a very important role. Local origin is probably very close to the expected properties of freshness, but freshness has no direct link with expected ethical or sustainable practices, which have a close relation to personal values. To obtain a more thorough understanding about the link, the two concepts need to be included in the same experimental design, where the relationship between freshness and value orientations is studied.

6.6 Limitations

The data used in this study was gathered during two separate projects; the first one concentrated on freshness and the second one on food origin as a value-adding factor in a consumer context. Due to this, the two topics were studied in different test setups, which makes a direct comparison difficult. Although it was not possible to verify the link between these two concepts, there is a strong indication of a notable overlap justifying further studies where both of these concepts are included in the same experimental design. The terms are frequently used in academic studies, but they are not thoroughly structured in the academic sense and require more work on the subject. While the concepts were discussed in parallel with each other, the link at this point is not based on comparative studies. The effect of value orientations and freshness were not examined in the present study, leaving some room for speculation about the true nature of the effect.

The first study was executed using only lettuce, which reduces the possibility to generalize the results. Freshness is product-dependent and the relevant product attributes vary significantly. In the test case, the aim was to study whether a product, typically used as minimally processed, differs from freshly-prepared in the consumer context. In the second study, only three of the four fish soup samples were offered in the consumer study and the one with fresh fish and fresh vegetables was excluded. This is a definite weakness, as it is not possible to make a complete comparison with the sensory characteristics study. In addition, the generalizability of these results is subject to certain limitations as only one type of product was used. The applicability needs to be studied further using other ingredients and dishes.

In Study III and IV the set up was not replicated exactly across the studies, as the products were different between the different age groups. Due to this, the comparison is challenging and further studies are needed to verify the effect. The evaluated product properties were based only on written information about the products in question and there is a certain amount of uncertainty on the applicability of these results on real-life products. Moreover, the age distribution

did not completely cover the full spectrum of possible respondents. The participants were adolescents and young adults leaving the older respondents outside the study. Due to the age dependency of food choices and values, the results may be different within older groups.

6.7 Further research and practical implications

The results indicate that although freshness is bound to the individual component, fresh-like properties may be reflected in the other dish components. In this case, the quality of fresh fish affected the evaluations of perceived vegetable texture, but the effect could not be verified. The soup with only frozen ingredients had the worst evaluation regarding all the evaluated properties showing that freshness is a valuable property in the cooked product as well. This infers that freshness perception can be enhanced by replacing individual components of a dish to raise the level of perceived freshness. The effect needs to be studied further with a wider variety of components and complete dishes. The holistic nature of freshness can be described as overall freshness, which is the sum of sensory properties and combination of product-related information. The model introduced in this work considered freshness as a holistic system with specific dimensions, which is a novel way to describe the freshness experience. As freshness is not usually presented in a similar model, the applicability of this model in practice requires further studies. Even though the hedonic properties of a product may satisfy the demanding consumer, the overall freshness can still be fortified with additional information on the expiry dates or product origin. Not all consumers are experts on the evaluation of freshness so they may require additional information to support the final decision. The expert and consumer aspects of freshness should be tied more closely together in the future to enable the overall perception of freshness to be based on facts or safety information as well as sensory appeal.

The current research was aimed at clarifying the overall notion of freshness and its relation to food origin, however, more work is needed to achieve a more profound understanding. According to the concept of local food constructed in the present study, locality is strongly linked to ethical and environmentally friendly production methods as well as the desire to support a local economy. The relationship between values and freshness should be studied more thoroughly to be able to verify whether the two concepts can be distinguished or are they perceived as similar concepts. Willingness to use and support local foods may not be tied only to freshness, but peoples will to support their local economy. Such support also entails a concern for a decrease in the environmental effects of food transportation, and the farmers, who are struggling to make a decent living under the pressure from centralized food markets. This is where consumers

use their values to guide their decisions and it goes beyond freshness into an ethical dimension. Local food is considered to have appealing properties, but maybe the main appeal lies in the capability to differentiate from bulk production, and therefore, they provide new experiences for demanding foodies. As there is no standard for the quality of local products, in future studies a similar approach to that used in this study where origin was communicated based on written description might be useful in order to exclude any possible variation in sensory quality.

7 CONCLUSIONS

Food freshness is a flexible system consisting of sensory and non-sensory properties and it produces a positive sensory perception in both, unprocessed and cooked products. In this work both product origin and especially locality added value to the product, however, the effect was not completely consistent. The appreciation of freshness may be more relevant to those individuals valuing good sensory qualities, but the appreciation of local food was related more closely to personal value orientations. The direct relationship between freshness and locality was not studied, but rather the contextual link between them based on separate studies. However, numerous other studies indicate that consumers frequently link these two concepts, although the nature of this connection is not usually considered in any depth. If freshness and locality could be connected, the combination could appeal to much wider consumer groups despite their personal values.

Based on this study, it can be concluded that freshness does exist as an attribute recognized by the consumer based on sensory properties, but it also has knowledge-based dimension. The conception of local food is based on expectations of desirable product attributes, because the locality cannot be standardized. Consumers attached very similar attributes to local and fresh products; they had a certain appeal, which in turn had an effect on food choices on many occasions. Personal values explained the preferences based on product origin, but the effect was dependent on product type and demographic factors. Freshness was more often seen as a token of good quality and safety, which may be more appealing especially to hedonistic individuals. Despite the two concepts overlapping, they do not describe the same concept as local food has stronger ties to ethical conduct, which is not typically connected to freshness.

This work provides a starting point for how to conceptualize freshness and local food using the introduced models as well as the link between them. However, although the concepts were separate, their similarity in certain parts infers an existing link that should be considered in the future. As the approach is rather novel, there is multitude of incremental steps that need to be taken to obtain a more thorough understanding.

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