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Creating a market for a more sustainable alternative: entomophagy businesses in Europe

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Master's thesis

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Abstract of master's thesis

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Abstract

Given the great potential of insects as a more environmental friendly protein source that can contribute to food security, it is interesting to investigate the penetration of entomophagy in Europe. European countries are strongly influencing global food policies and an increased acceptance of insects as food could have major impacts globally.

This thesis is looking at the role of businesses providing insect food products in creating a market for entomophagy in Europe, investigating which actions and strategies are used for convincing different actors of the value and legitimacy of insects as a food source to open the way for a more sustainable alternative.

The research is based on an extensive case study with six sample companies from different European countries showing a variety of options for the commercialisation of edible insects in terms of product and product range, sales argument, used channels and selected customer segment. The data combines interviews with one company representative per case and information available on the company websites.

The research shows that businesses play an important role in the creation of markets for edible insect food products. They make insect food products available in Europe and actively engage in communication and outreach activities to promote entomophagy at large, combining information, education and exposure. Two major strategies can be revealed in the sample: processed products with invisible insect ingredients in everyday products are adapted to the local food culture and aim at decreasing psychological barriers and increasing convenience while whole insects or products with strong insect taste rely on the interest evoked by the insects themselves for convincing consumers. High quality and professionalism are crucial and collaboration with experts in different fields is common in the sector. The sustainability aspect of edible insects plays an important role in motivating entrepreneurs to start insect food businesses while in business communication it is mainly used as an additional argument for legitimating insect food products.

Keywords entomophagy, edible insects, market creation, sustainability, business model, legitimacy, novel food, alternative protein source, Europe

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Abbreviations

BIIF - Belgian Insect Industry Federation
CO_2 - Carbon dioxide
EU - European Union
FAO - Food and Agriculture Organisation of the United Nations
FASFC - Federal Agency for the Safety of the Food Chain (Belgium)
FFPIDI - French Federation of Producers, Importers and Distributors of Insects
FP7 - Seventh Framework Programme for Research of the EU
GHG - Greenhouse gases
VENIK - Dutch Insect Farmers Association
WHO - World Health Organisation

1. Introduction

In this chapter I give a short background to my research and explain why it is important. Then I present the research question and objectives of my thesis as well as the limitations of the research. In a next part the most important concepts of the research are defined to ensure a common understanding of the terms used; and finally I give a short overview of the structure and content of the thesis.

1.1 Background

In view of a growing population and the impacts of climate change, global food security is becoming an ever more pressing issue. As the question arises how a population of 9 billion should be fed with a reduced availability of water and land, and agriculture reaching its efficiency limits, insects are being discussed as a possible sustainable food source for the future (van Huis et al. 2013). Over 2000 insect species are already being consumed worldwide and are a normal and important part of the diet especially in Asian, African and some Latin American countries (Jongema 2014). Insects are a good source of proteins and healthy fats as well as diverse minerals of which iron and zinc are of particular importance (Mlcek et al. 2014).

In Europe, however, entomophagy - eating insects - does not play an important role in dietary habits and insects have been banned from a civilised dining table. The barriers to insects as food are not only the widespread disgust regarding insects in general, but also the novelty factor plays an important role (van Huis 2013). A further hindrance is legislation in the European Union (EU) that has so far failed to give clear guidance and support a more stable environment that would speed up industry development and make insect food products easily available for European consumers (van Huis et al. 2013).

Nevertheless, there are first signs that insects are being considered an interesting food source. Scientific research is investigating the nutritional qualities and environmental benefits of insects (Mlcek et al. 2014, Ooninx et al. 2010, Rumpold and Schlüter 2013, van Huis 2013, van Huis et al. 2013, Verkerk et al. 2007) and is identifying strategies to increase consumer acceptance (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, Looy et al. 2014, Tan et al. 2015). Media report of high-end restaurants in major European cities starting to experiment

with insects as an exotic ingredient, start-ups in different countries offer a variety of dried species as well as products with more or less distinguishable insect ingredients in terms of visibility and taste, and in some pioneering countries such as Belgium and the Netherlands, first insect food products are available in supermarkets or university cafeterias.

According to an article in *Fortune* (Kowitt 2015), new food trends are now adopted faster than ever before. Has the time come for Europeans to introduce insects into their diet, throw the prejudice overboard and make way for a more sustainable protein source? A number of entrepreneurs who are convinced that the answer to this question is yes are the subject of this study that gives insights into how companies are contributing to creating a market for insect food products in Europe.

1.2 Research gap and problem

In the field of entomophagy, scientific research has focused mainly on the benefits and possible risks of insects as food source (Mlcek et al. 2014, Ooninx et al. 2010, Rumpold and Schlüter 2013, van Huis 2013, van Huis et al. 2013, Verkerk et al. 2007) and on consumer acceptance, where the main barriers and influencing factors as well as ways to increase the attractiveness of insects as food are discussed (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, Looy et al. 2014, Tan et al. 2015). Also consumer acceptance of insects as a substitute for meat has been investigated (Schösler et al. 2012; Vanhonacker et al. 2013; Verbeke 2015) and the Food and Agriculture Organisation of the United Nations (FAO) has published a review about edible insects and their role in future food security (van Huis et al. 2013).

What has not been researched so far, however, is how the market for edible insects is being created in Europe. In order to illuminate this under-researched phenomenon, I examine the different approaches taken by businesses that already offer edible insect products in Europe. It is valuable to study existing businesses because they allow to gain insights into which actions and strategies are used to create the market for insect food products and give working examples of how barriers to insect eating can be overcome in practice. In this way scientific findings on how to increase consumer acceptance that have been based on consumer research can be complemented with the practical approaches successfully employed by businesses in the field. The company perspective can also give insights into what action is needed by other actors to

support the emergent industry and foster the spread of entomophagy as a practice that can increase the sustainability of the food system in Europe.

Furthermore, the phenomenon of market creation for sustainable products has not been investigated much in the emergent field of sustainable entrepreneurship so far, where researchers have focused among others on defining sustainable entrepreneurship (Binder and Belz 2015), sources of entrepreneurial opportunities that can lead to sustainable entrepreneurship (Cohen and Winn 2007, Dean and McMullen 2007), the individual entrepreneurs and their determinant characteristics (Patzelt and Shepherd 2011, Kuckertz and Wagner 2010), and the different degrees of implementation of sustainable practices in the enterprises (Schick et al. 2002, Spence et al. 2011).

Overall, my research can thus help to better understand the insect food industry in Europe, its emergence and the challenges the businesses in the sector are facing, and can give insights into market creation for sustainable products by showing what is being done and what is still needed to support the growth of this sustainable alternative.

On a personal level, investigating the role of businesses in the creation of markets for more sustainable alternatives allows me to combine my fields of expertise in business and sustainability and to show how entrepreneurs and their choices can make a difference and can encourage changes towards more sustainable lifestyles.

The insect food industry that is investigated here, is thus to be seen as an example for an industry created in response to a sustainability issue on a global level that is trying to change local habits to open the way for a more sustainable future. The market creation process here could give ideas on what needs to be considered also for other more sustainable alternatives that are yet to come, always keeping in mind, however, that each industry and the conditions influencing its emergence are different and can require very distinct actions to be successful.

The geographical setting of the research is Europe. This is particularly interesting because of the current emergence of an edible insect industry despite the uncertain legal status of insects as food within most of the EU, and because of the strong European influence on global food policy choices where insects have so far been neglected as a valuable source of protein in spite of their environmental friendliness because they are not accepted as food in many Western countries. A spread of entomophagy in Europe and the connected increase in consumer

acceptance could therefore engender positive changes towards global food security and climate change mitigation. (Looy et al. 2014, van Huis et al. 2013).

1.3 Research question and objectives

In order to contribute to filling the research gap explained above, with this thesis I answer the following research question:

How do businesses offering edible insect food products contribute to the creation of markets for entomophagy in Europe?

The objectives I try to achieve with my research are the following:

- Gain insights into market creation and related challenges in the insect food industry
- Understand how entomophagy is made viable by European businesses offering insect food products
- Collect and present different business model choices that support the development of this emergent market
- Verify which aspects highlighted by scientific research as needed for increasing consumer acceptance of entomophagy are applied in practice
- Investigate the value of the sustainability aspect of insects for the creation of an insect food market

In my thesis I look at business model and communication choices of the companies offering insect food products to understand how an emergent market is developed and how insects can be made sellable and desirable food products in Europe. Using the business model canvas developed by Osterwalder and Pigneur (2010), the value proposition and promotion methods represent the core of the research, but also the choice of distribution channels, key partners and customer segments are examined. Literature in the fields of market creation, entomophagy, food choice, and sustainable entrepreneurship is used to guide the research and allow for a better understanding and interpretation of the collected data.

1.4 Limitations

In my thesis, the aim is not to compare different marketing strategies or to draw a complete picture of the business model choices possible for selling insect food products; rather I am interested in understanding which factors are important for the development of emergent markets from the business point of view and which actions are taken by businesses to make insects desirable.

The geographical scope of the study is limited to Europe, as mentioned above, and within the European context, the operating countries of the six sample companies are the main focus. Given the newness of entomophagy in Europe, the industry still counts only few actors and the information available to date represents the very early stages of the industry development. The data collected covers the company development of each case company from its foundation between 2011 and 2014 to information available in June 2015 when the data collection was concluded.

In terms of the sample, the study has the limitation of not being representative for the industry, due to the small number of actors in the field and the slightly one-sided willingness to participate in this study as is explained in detail in the methodology chapter. The sample shows a dominance of companies offering processed insect food products and does not include any companies importing edible insects from Asia, nor companies offering insect flour or paste for further processing. Nevertheless, the selected case companies do show a vast variety of product offers, argumentation focus, and channel and customer segment selection that is possible within the industry and are therefore interesting for the investigation of different strategies for market creation in the insect food industry.

1.5 Definitions

The following concepts are of particular importance in my research and are used as defined below. The definitions of scientific terms are taken from the Oxford University online dictionary, while for concepts such as *food security* and *sustainability* the official definitions brought forward by global institutions or scientific research are used. The last category of defined words includes terms and word groupings that are commonly used but can be interpreted in different ways as well as terms related to insect foods that are not (yet) commonly

used. For those expressions, I present my own interpretation to clarify their use in this research and avoid confusion with possible different interpretations by the reader.

Entomophagy: the practice of eating insects, especially by people (Oxford University Press 2015a)

Field: a sphere of activity or interest (Oxford University Press 2015b); here the term is mainly used to refer to research in a specific area or to the insect food industry

Food security: when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (WHO 2015)

Industry: a particular form or branch of economic or commercial activity (Oxford University Press 2015c); here the term mainly refers to the insect food industry that includes businesses that produce and commercialise food products containing edible insects

Insect food product: product for human consumption that consists partly or entirely of insects

Invisible insect ingredients: can include ground up insects in the form of flour or paste, or extracted insect protein

Market: a social arena where firms, their suppliers, customers, workers, and government interact (Fligstein and Dauter 2007, 107)

Market creation: activities and social interaction that lead to the establishment of a market

Neophobia: extreme or irrational fear or dislike of anything new or unfamiliar (Oxford University Press 2015d)

Sustainability: ensure that development meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations 1987)

Sustainable entrepreneurship: the discovery, creation, and exploitation of opportunities to create future goods and services that sustain the natural and/ or communal environment and provide development gain for others (Patzelt and Shepherd 2011, 632)

Sustainable product: product with socio-ecological benefits

Western: lifestyles or attitudes originating from Europe or the United States

1.6 Thesis structure

Now that the topic of the thesis has been introduced and key concepts explained, in the next chapter I review different literature of relevance for the study. I introduce market creation as the phenomenon that is being researched in this thesis and then review entomophagy and food choice research to put entomophagy in context in Europe, including reasons for eating insects as well as obstacles on the psychological and practical levels. To better understand the company perspective, I look at sustainable entrepreneurship literature that can support the understanding of what drives the entrepreneurs and present the business model canvas as a tool for examining how the sample companies bring insect food products to the market.

Following the theoretical framework, in chapter 3 I explain the methodological choices I have taken for my thesis and I expand on qualitative research and more specifically multiple case study design, data collection and data analysis methods used, and the epistemological perspective taken in the research.

Thereafter I present the six cases that are studied for this thesis one by one to give a short overview of each case and present their particularities. I then proceed with the findings section where I report the results of the cross case analysis that is structured according to the codes used for analysis grouped around the categories of the business model canvas. Here the main similarities and differences between the companies studied are highlighted and explained in detail.

In the discussion chapter I use the theoretical framework presented at the end of chapter 2 to interpret the relevant data collected in the findings in chapter 5. And finally, the conclusion summarises the main findings, highlights practical implications of the research and shows where further research is needed.

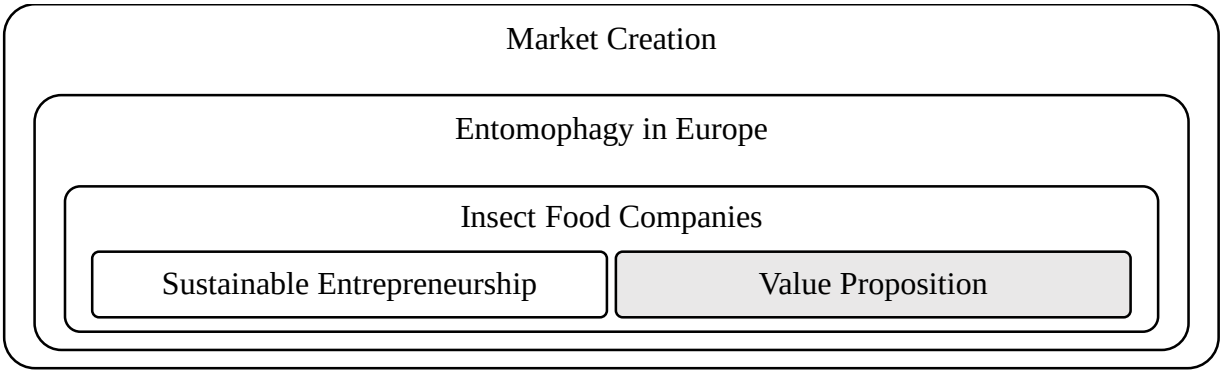
2. Literature review

In this chapter I review the extant literature relevant for my research. After introducing market creation as the phenomenon that is being researched in this thesis, I put entomophagy in context in Europe. I first explain the reasons that make the consumption of insects as food desirable. Then I give an overview of the barriers present in Europe that hinder the penetration of insects as food. This includes psychological factors that influence food choice, such as neophobia and the feeling of disgust, as well as issues of legislation, a lack of research and access to insect products.

The main actors investigated are companies providing insect food products. As the entrepreneurs engage in an activity with a strong sustainability aspect, in a next part I review sustainable entrepreneurship literature that gives a better understanding of this specific type of entrepreneurship. As there is a lack of research about how sustainable entrepreneurs create markets for their offer, I present the business model canvas as a tool for gaining a clearer view of the choices that need to be made in the companies to bring the product to the targeted customers. At the core of the research is the value proposition and supporting business model choices that are examined to understand how the companies create a market for their novel products. Figure 1 gives an overview of the topics covered and shows how they are related to each other.

The final part of the chapter summarises the most important concepts in the theoretical framework that is used for interpreting the findings in the discussion in chapter 6.

Figure 1. Visualisation of the topics covered in the literature review



2.1 The creation of new markets

A market is a "*social arena where firms, their suppliers, customers, workers, and government interact*" (Fligstein and Dauter 2007, 107). The market is often described as a process that is shaped by the interaction between individuals. Market creation is thus to be seen as the initial stage of this process of interaction that gives rise to a spontaneous order that has not been planned. (Storr 2009). The creation of social structures between different actors is an integral part of market creation and social relationships help stabilise new markets (Fligstein and Dauter 2007). In the market, entrepreneurs act as middlemen between resource owners and consumers, recognising and acting upon opportunities, often through the development of innovation (Storr 2009).

Looking at new ventures in emergent markets, Aldrich and Fiol (1994) point out that in addition to the challenges all new ventures are facing, creating a business in a new market implies that there is limited knowledge about the activity that is being carried out and about how to do it, which increases the difficulties the companies have to address. Furthermore, the companies have to actively build up the market and legitimate their activities. The researchers highlight that the companies have to gain legitimacy that is twofold: cognitive legitimacy that is increasing the extent of knowledge about the activity and its realisation, and socio-political legitimacy that is based on the compatibility of the activity with existing cultural and political norms. (Aldrich and Fiol 1994). Earlier research about industry dynamics suggests that legitimacy increases as industries grow, as more actors in the field generate knowledge, spread the idea and raise awareness about the industry, and experiences by predecessors can be learned from. (Aldrich and Fiol 1994, Hannan and Carroll 1992).

Strategies to increase legitimacy of a new business in a new industry can be observed at different levels, according to Aldrich and Fiol (1994): first of all, social interaction with different stakeholders and persuasiveness are crucial. Here, framing the activity convincingly by using different rhetoric methods such as symbolism and abstraction and expanding the discourse to ideas stakeholders can relate to in form of a narrative, for example, are likely to generate success. On the industry level, legitimacy can be increased faster by establishing standards and norms that facilitate knowledge sharing and conjoint learning and by encouraging collaboration between industry actors. The establishment of a trade association can be useful to convey a picture of credibility and unity and strengthen the industry's negotiating power interacting and compromising with established industries but also with government bodies.

Finally, also collaboration with science partners can speed up the legitimation of a new industry. (Aldrich and Fiol 1994).

Trust plays an important role in market interactions and especially in new ventures in new markets (Aldrich and Fiol 1994), in situations where uncertainty is high (Kollock 1994). Granovetter (1985) talks about market embeddedness and describes the market as a setting that enables individuals to establish connections of trust, which in turn facilitate exchange. Trust relationships with different actors can enable a company to increase sales or gain easier access to resources and knowledge. Moreover, the industry development can be positively affected by good relationships with government bodies. (Fligstein and Dauter 2007).

Next to trust also reliability and reputation are essential for the success of a new market and actors within it. Those concepts are tightly linked with trust building and can contribute to the legitimation of the industry. (Aldrich and Fiol 1994). Selecting reliable partners with a good reputation can positively influence the process of building up trustworthiness and reputation in new markets where the products are not known yet and their qualities might be doubted. (Fligstein and Dauter 2007).

The relation with other actors in the field can vary in different stages of market and industry development and can move from strong cooperation to clear-cut market segments with different strong players predominating later on. In new markets, the impact of competition can also be much stronger as businesses in these new environments often have stronger resource constraints, need time to understand their position and gather experience and knowledge to develop their product to better fit consumer needs and expectations. (Fligstein and Dauter 2007). White (2002) suggests that by differentiating themselves from their competitors, companies can create new markets with reduced competition. This might be done not in response to demand, but rather in determining the promising spot between competitors.

Also culture influences the development of markets in given settings as it strongly affects the value and need perception of different actors (Fligstein and Dauter 2007, Storr 2009, Zelizer 1983). The development of a shared meaning for a new product is a process that involves both, producers and consumers, who make sense of the new offer together and shape meaning and market at the same time (Fligstein and Dauter 2007). Communication is an important tool to convince consumers of the legitimacy and value of new products, especially if they clash with culture in a way (Zelizer 1983).

To summarise the above, extant literature highlights the importance of social interaction in the creation of markets (Fligstein and Dauter 2007, Storr 2009) and suggests a number of strategies for new ventures in new markets to increase legitimacy, build trust and reputation (Aldrich and Fiol 1994). The object of my thesis being companies in the insect food industry in Europe, it is interesting to see which strategies are being applied and which relationships are particularly sought after for market creation in this context.

2.2 Context: Entomophagy in Europe

In my thesis I am investigating market creation for entomophagy in Europe. Entomophagy, or eating insects, is not a widespread practice in Europe. To explain the context of my thesis, I first focus on the reasons for considering the introduction of insects into the European diet. Then, I look at obstacles for the spread of entomophagy and at literature that investigates how psychological barriers might be overcome. Finally I explain the situation of entomophagy in Europe in terms of legislation, research and industry development.

2.2.1 Why eat insects?

The benefits of insect eating are thoroughly discussed in literature and show that insects are a valuable food choice for a variety of reasons. One of the main aspects that make insects interesting for human consumption is their nutritional value. Although the nutritional value varies widely between different species and development stages, many edible insect species are proven to be a healthy food source (Mlcek et al. 2014, van Huis 2013, Rumpold and Schlüter 2013, Verkerk et al. 2007). According to the review conducted by Mlcek and colleagues (2014) insects are rich in high-quality protein, containing essential amino acids that can easily be digested and can thus replace other protein sources such as meat or soy; the fat content of edible insects shows a higher amount of essential fatty acids than other animal fats and the amount of carbohydrates is low, deriving mainly from the chitin that constitutes the exoskeleton. The chitin itself has been found to have positive health impacts and is being used and further investigated for medicinal purposes. Depending on the species, development stage and diet, insects can contain high levels of different minerals, such as potassium, sodium, calcium, zinc and iron. They are also a good source of vitamins, especially B-vitamins. (Mlcek et al. 2014).

A further health benefit is the fact that insects are less likely to cause human health risks as known from other livestock such as swine and avian influenza for example, because of their taxonomical distance from humans (van Huis 2013). However, certain risks remain and allergic reactions to insects as well as contamination of insect food products are possible. Food safety, hygiene standards, safe processing methods and clear labelling need to be introduced to reduce the risk of contamination and inform about allergy risks. (Rumpold and Schlüter 2013).

In addition to their nutritional value, and reduced human health risk, insects are eaten in many countries for their taste (Nonaka 2009, Ramos-Elorduy 2009). Van Huis (2013), for example, points out that insects are often seen as delicacies and chosen although they might be more expensive than meat products. And while Mlcek and colleagues (2014) argue that with the vast variety of edible insect species available, everyone should be able to find the ones' that suit their taste, Evans, researcher at Nordic Food Lab, states that "*the Western palate simply doesn't know how delicious insects can be*" (2014, 30). He suggests the experimentation with insects as spices, for example ants that appear with a variety of tastes, or the degustation of distinct textures of different species and preparation methods to discover the deliciousness of insects and diversify Western diets (Evans 2014). In fact, more and more restaurants in European cities start to embrace this way of thinking and include insects in their dishes as special ingredients. Also a growing amount of insect cookbooks are being published around the world. (van Huis et al. 2013, Verkerk et al. 2007).

It should also be considered that we already consume insect products and insects in our daily lives. Products from bees such as honey, propolis and beeswax for cosmetics and candles and silk produced by silkworms are the most common insect products widely in use. Also red dye called cochineal that is used commonly in food, fabrics and pharmaceuticals is derived from scale insects; and the resilin protein extracted from the human flea is of high medicinal value as it is used to repair human arteries (van Huis et al. 2013). Furthermore, many food products contain insects or traces of insects. As it is impossible to remove all of them in many industrialised production chains, legislation defines an upper limit for the amount of insect traces allowed in different types of food (MacClancy et al. 2007, van Huis et al. 2013).

From a global perspective entomophagy is often brought in relation with the issue of food security. Food security, as defined by the World Health Organisation (WHO), exists "*when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life*" (WHO 2015). In 2014, 805 million people worldwide were undernourished and 2

billion suffered from micronutrient deficiencies, so-called hidden hunger (IFPRI 2014). With the world population expected to reach 9 billion by 2050, the development of a sustainable food system is of major importance. The high meat consumption in Western countries and the growing middle classes in developing countries, especially in China, East Asia and North Africa with an increased purchasing power and access to more expensive food products such as meat and dairy put additional pressure on the system. A higher demand for meat also implies a rising need for animal feed that is in direct competition with food production for human consumption. (Msangi and Rosegrant 2011). The challenge is further increased by the reduced availability of land, water and energy as main resources for food production, and more and more noticeable impacts of climate change (von Grebmer et al. 2012). It is thus likely that in the near future the supply of food and more specifically the supply of animal derived protein will be a pressing issue (van Huis 2013).

Insects have great potential in the fight against hunger, because they are rich in protein, unsaturated fatty acids and diverse micro-nutrients and vitamins, as mentioned before, and because of their reduced environmental impact that makes them more viable for feeding the world than conventional animal protein sources as is explained further down. They can thus contribute positively to the diet of the nearly 3 billion under- and malnourished worldwide. However, insect eating, that is traditionally practiced in 130 countries worldwide (Ramos-Elorduy 2009) is in decline in many countries as eating habits are changing, more and more people live in urban areas (Rumpold and Schlüter 2013) and pesticides used in agriculture contaminate insects that were traditionally collected in the wild. Local communities are often left without a resource that used to provide them with important nutrients. (Looy et al. 2014). While the change in eating habits can be ascribed to the spread of globalisation that is homogenising flavours and diets (Ramos-Elorduy 2009), the reduced availability of safe edible insects is at least partly caused by neglecting insects as an important food source in global food policies. Given the big influence of the United States and the European Union on global food policy decisions the introduction or at least acceptance of insects as food in Western cultures could have major impacts on the sustainability of the global food system and could lead to increased research and innovation efforts in the area of edible insect rearing that has so far been marginalised. (van Huis et al. 2013).

From an environmental perspective edible insects are very interesting and present a viable alternative protein source that can be used for food and feed. The production of edible insects

has higher efficiencies in terms of feed, water and space use than conventional livestock (Rumpold and Schlüter 2013, van Huis 2013). Insects have very high feed conversion ratios, which means that they are efficient in transforming feed into biomass. For the cricket species Acheta domesticus, for example, 1.7 kg of feed are needed to increase the live weight by 1 kg, while for a chicken 2.5 kg are needed and for beef 10 kg of feed produce 1 kg of live weight increase (van Huis 2013). This is due to the fact that insects are cold-blooded and do thus not require energy and feed to maintain their body temperature (Oonincx et al. 2010). The cold-bloodedness also reduces their need for water intake and results in insects deriving the needed moisture from the feed which drastically reduces their water footprint. (Rumpold and Schlüter 2013, van Huis 2013). In terms of space use, in order to produce the same amount of protein, chickens and pigs need twice or three times the space needed for mealworm farming, and the same amount of protein derived from beef requires 10 times the space (van Huis et al. 2013). The efficiency of insects is further increased by the fact that a high percentage of their live weight is edible, with some species being eaten as a whole and others having only parts of the exoskeleton like legs or wings that need to be removed or are indigestible (van Huis 2013). Table 1 summarises some findings of previous studies that compare the resource efficiency of crickets or mealworms with the one of chicken, pork and beef production.

Table 1. Resource efficiency comparison between insect species and conventional livestock

	Protein per kg edible weight	**Edible portion**	**Feed conversion ratio – kg feed:kg live weight**	**Feed use – kg feed: kg edible weight**	**Virtual water use**	**Land use ***
Mealworms	-	100%	-	-	Considerably lower	1 ha
Crickets (adults)	205 g	80%	1,7	2,1	-	-
Chicken	200 g	55%	2,5	4,5	2.300 l	2 – 3.5 ha
Pork	150 g	55%	5	9,1	3.500 l	2 – 3.5 ha
Beef	190 g	40%	10	25	22.000 l	10 ha

Sources: van Huis 2013; * van Huis et al. 2013

Furthermore, Oonincx and colleagues (2010) found that the emissions of greenhouse gases (GHG), such as carbon dioxide (CO_2) and ammonia, in insect production are similar or lower than for conventional livestock and that the edible insect species studied - mealworm, house

cricket and migratory locust - do not emit any methane. Rumpold and Schlüter (2013) also point out that the much higher fecundity of insects compared to conventional livestock facilitates production. Moreover, many insect species that are suitable for human consumption can feed on organic waste which further reduces their impact on the environment (Rumpold and Schlüter 2013, van Huis 2013). This means that by giving insects a bigger role in the food production chain, most of the above mentioned pressures related to food security as well as the impact of animal derived protein production on climate change due to GHG emissions, could be reduced. However, life cycle assessments of food products containing insects still need to be made to confirm this (van Huis 2013, Rumpold and Schlüter 2013).

In addition to the above mentioned environmental and health benefits of insects as food and feed, the FAO also mentions social and economic factors in favour of entomophagy. Insect rearing is an economic activity that can be carried out also by the most vulnerable and poor groups in cities and in rural areas alike. It can be a low-tech and cheap practice and does not require land holdings as it can be practiced on a reduced space (van Huis et al. 2013). Moreover, often insects seen as pests in crop production could be collected and sold at a higher price than could be achieved for the crop that is being produced. Van Huis (2013) mentions the concrete example of grasshoppers that are collected by women in millet fields in Niger. The grasshoppers would destroy the millet, so by collecting them the women save the harvest and gain an additional income from the grasshoppers that achieve a higher price than the millet if sold on the market. (van Huis 2013). This means that pesticide use could be reduced (Rumpold and Schlüter 2013) and at the same time the livelihoods of the most vulnerable could be improved.

2.2.2 Psychological barriers to insects as food and how they can be overcome

Notwithstanding all the reasons for introducing edible insects into the European diet, there are clearly a number of obstacles that hinder entomophagy from taking hold in Europe. The main issues mentioned in literature are of psychological nature.

Entomophagy has been practiced by humans since Paleolithic times and has evolved over time in different societies according to the specific circumstances they were facing (Ramos-Elorduy 2009). Still today more than one out of four people worldwide eat insects on a regular basis (van Huis et al. 2013) and over 2000 different species of edible insects have been recorded (Jongema 2014). In some cultures, however, eating insects has been marginalised and is not

considered an acceptable practice anymore. In fact, in many Western societies insects have become "inedible" as the predominant food culture dictates (Looy et al. 2014). What is acceptable to eat and what has to be avoided is largely determined by the community an individual grows up and lives in (Cantarero 2007). While it is perfectly acceptable to eat grasshoppers in Thailand, for example, the same is not true in Finland.

The social definition of what does and what does not classify as food does not only determine food choice, but can also evoke a physical reaction from the body - a feeling of disgust and even malaise - if an unaccepted product is to be eaten (Cantarero 2007). Rozin and Fallon (1987) identify four types of food rejection: distaste, danger, inappropriate and disgust. They can be generated by an adverse sensory aspect of the food such as bad taste or unfamiliar texture, if the individual knows or suspects that the food will do harm either in terms of health or social status, or for so-called ideational factors. This last category is highly culture dependent as it refers to the knowledge about what the food is and where it comes from and influences what is thought of as disgusting and/or inappropriate. Ideational factors can thus be the reason to opt against eating insects, simply because they are insects. Rozin and Fallon (1987, 25) also find that what is thought of as dangerous and disgusting often overlaps in a misleading way. At the example of a cockroach they show that the perception of it being dangerous can easily be ruled out with the question: "*Would you eat a sterilised cockroach?*" It then becomes clear that the cockroach is a non-desirable object not because it might affect the health, but simply because it is associated with dirtiness and evokes a feeling of disgust.

There is a general aversion to insects in Europe and the United States where they are commonly associated with disease transmission, dirtiness and crop destruction, and often trigger a reaction of fear. Therefore, it is not surprising that the ingestion of insects as food can be challenging for European minds. Looy and colleagues (2014, 135) talk about "*a perception of insects as alien, reminders of our animality, and generators of disgust*." Eating insects is thus a practice of sub-human level and can even engender a sort of racism towards entomophagous societies that are not considered fully human. This aversion towards insects and feelings and behavioural patterns related to it, are passed on from generation to generation with the food culture of a community. In this way disgust for certain things is replicated and at the same time food choice is used to distinguish oneself, or one's group from another. (Looy et al. 2014). The social definition of food and non-food is a very strong determinant of food choice in societies, however, it is not permanent (Cantarero 2007). This means that although currently the aversion

towards insects is strong, this might change over the years and insects can become an accepted food just like sushi that was in a similar situation in the past and is now a widely available delicacy (van Huis 2013).

Due to globalisation it is more and more common that new foods are introduced into a community where they are not traditionally eaten or accepted as food. These novel foods are confronted with a low initial consumer acceptance because of neophobia. Neophobic individuals prefer to eat what they already know and avoid unfamiliar food. (Barrena and Sánchez 2012). Martins and Pliner (2005) find that, in accordance with previous studies, neophobia as well as the feeling of disgust are stronger towards animal foods compared to non-animal foods and Verbeke (2015) identifies neophobia as the most determinant factor when it comes to willingness to eat insects. According to his research, individuals with a one unit higher food neophobia score are 84% less likely to adopt insect food products. He also highlights the need of communicating how insects are reared and processed in order to decrease rejection due to food technology neophobia, the avoidance of food produced with new technologies that often affects the acceptance of edible insects negatively, based on wrong assumptions. (Verbeke 2015).

While the main factors influencing food choice for known food products are taste and a predicted positive effect on health, the main reasons not to try or to try novel foods are the perception of disgust versus the interest evoked by the product, where the latter is less influential (Martins and Pliner 2005). Therefore it is important that edible insects are presented in a way that makes them more attractive and interesting in order to lower the threshold for trying them. Positive transvaluation, emphasising the good taste and health benefits of novel foods, has been proven to be a successful strategy for increasing the number of people who are willing to try those foods. However, Martins and Pliner (2005) point out that this has not been tested with novel foods perceived as disgusting and more research is needed in that area.

Several studies have been conducted on consumer acceptance of edible insects in different countries. Tan and colleagues (2015) evaluated the importance of cultural exposure and individual experience by comparing Thai and Dutch opinions about different edible insects and preparation methods. They found that both, individual experience of eating insects and cultural exposure, seeing insect food products and people eating them in the social environment, increase the willingness to try edible insects. For individuals with limited or no experience in eating insects, the expected taste and associations triggered by the food are crucial for the

willingness to try. (Tan et al. 2015). Positive associations and the expectation of a pleasant taste would thus lead to tasting the insects while negative associations, a sensation of disgust and expected bad taste or texture would lead to a rejection of the food, independent of the actual taste of the product (Tan et al. 2015, Rozin and Fallon 1987). For those individuals it is also preferable to have food with insects in invisible form, for example ground up, while experience with insect eating increases the willingness to eat insects as a whole. Therefore, also the preparation method plays an important role: the combination of insects with known and appreciated ingredients can increase the acceptance of the food. However, this depends on individual food preferences and expectations about how insects should be prepared. The cultural context is determinant here, as known species, flavours and preparation methods are preferred. (Tan et al. 2015).

Also Lensvelt and Steenbekkers (2014) conducted a survey and experiment with Dutch and Australian consumers to determine which factors are the most important in the promotion of edible insects in Western societies. Price, quality, availability and an easy preparation are of significant importance for the participants of the study. It is also interesting to note that the participants see no personal benefit in eating insects, but they do acknowledge the environmental friendliness of insect food products as compared to e.g. meat. They associate insects with natural food and only few Australians but not the Dutch participants are concerned about health risks associated with insects. Like in the study by Tan and colleagues (2015), participants mentioned that it is easier to eat insects mixed into a dish and in unrecognisable form rather than eating them as a whole. (Lensvelt and Steenbekkers 2014). This is also the main finding of a research about consumer acceptance among Belgian consumers (Caparros Megido et al. 2014).

All three studies have the limitation that the sample investigated is not representative for the countries' populations and does therefore not allow for generalisations. It also needs to be highlighted that in the studies conducted by Tan and colleagues (2015) and Caparros Megido and colleagues (2014) the participants showed a particular interest for insects and were probably more open towards insects as food than the average population.

Acceptance of insects has also been investigated in relation with the substitution of meat for environmental reasons. The study conducted by Tan and colleagues (2015) mentioned above, also shows that for Dutch consumers, insects are an interesting food source because of the sustainability aspect, as a replacement for meat. In a more representative study of Belgian

consumers, Verbeke (2015) examined the profile of potential insect adopters as a substitute for meat and found that the group with the highest likelihood of entomophagy adoption are "*younger males with weak attitudes towards meat who are open to trying novel foods, and who are interested in the environmental impact of their food choices*." (Verbeke 2015, 154). The overall results show that nearly one out of five Belgian consumers feels ready to adopt insects as a meat substitute. He compares with a study by Vanhonacker and colleagues (2013) that was conducted two years earlier in the same region and found only 5% of the sample being ready to consume insect protein.

A study by Schösler and colleagues (2012) compared different possibilities for meat substitution and found products with visible insects to be the least liked option. A pizza containing insect protein in invisible form, on the other hand, was more accepted especially by younger age groups and convenience oriented consumers. Those findings are interesting and need to be taken into consideration when insect food products are developed and marketed. However, it is important to notice that there are different reasons to consume insects and the studies mentioned here were focused only on insects as a meat substitute.

The above studies show that, although it might be limited, there is a market for insect food products also in countries where insect eating is not a traditional practice. However, consumer acceptance needs to be actively built up and psychological barriers need to be reduced. In order to successfully change the mindset about insects in Europe and the United States, rational, emotional and cultural aspects need to be considered (Looy et al. 2014). The researchers suggest that information, education and exposure to entomophagy can help to increase consumer acceptance, as will be explained more in detail next. (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, Looy et al. 2014, van Huis et al. 2013).

Knowledge about entomophagy is still limited and although some potential consumers are aware of its health and environmental benefits, a lot of potential for improvement remains. Information about the benefits of insects as food and education that pushes towards including insects into the food culture or at least accepting them as a legitimate food and countering the widespread disgust could aid the penetration of insect food products in European eating habits. (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, van Huis et al. 2013). It is also important that information about how insects can be prepared to achieve the best taste and health benefit is readily available (Looy et al. 2014). Verbeke (2015) points out that communication about entomophagy should be tailored to different groups of potential

consumers, as reasons for and against eating insects vary widely in different groups. Also the factor of pleasant taste should be highlighted more (Lensvelt and Steenbekkers 2014) in accordance with Martins and Pliner's (2005) suggestion of positive transvaluation mentioned above.

Lensvelt and Steenbekkers (2014) found that their samples from Australia and the Netherlands considered information provided by scientific research, persons using the product, the government and close family members and friends as being the most trustworthy for food products. The confirmation of safety and good taste by peers also increased the willingness to try insect foods considerably in the study conducted by Tan and colleagues (2015).

The social context, being exposed to edible insects, having the possibility to try and seeing others try seems to be the most important factor to increase consumer acceptance (Lensvelt and Steenbekkers 2014, Looy et al. 2014, Tan et al. 2015). As Tan and colleagues (2015, 87) put it "*although trying did not signify liking, it is a necessary first step to learning to like a food, where increased exposure to positive experiences with an unfamiliar food could improve its acceptance*." Taking this first step and experiencing entomophagy oneself often results in a more positive attitude towards edible insects and drastically increases the willingness to try them again (Lensvelt and Steenbekkers 2014, Tan et al. 2015).

Summarising the above it is clear that food choice is a complex process which depends strongly on culture. Insects as a novel food encounter neophobia and face the additional challenge of evoking feelings of disgust that are hard to overcome. (Looy et al. 2014). In order to make insects a desirable food, the focus should be on a presentation that minimises the disgust factor and communication of the taste and health benefits that they provide (Lensvelt and Steenbekkers 2014, Looy et al. 21014, Martins and Pliner 2005, Tan et al. 2015). Communication should be clearly targeted (Verbeke 2015) and address not only the rational decision maker, but also consider emotional and cultural factors (Looy et al. 2014). Exposure and the possibility to try and learn appreciate the taste of insects is crucial for consumer acceptance (Lensvelt and Steenbekkers 2014).

2.2.3 Challenges related to an emerging industry environment

Beyond psychological factors influencing human food choice and the acceptance of insects as food, also the lack of legislation and research about edible insect rearing and commercialisation, as well as the limited access to insect food products due to the new and restricted industry

around entomophagy in Europe pose difficulties for the spread of the practice. According to van Huis (2013), three actor groups are essential for making insects a viable and acceptable food source: the state, science and industry. The state should intervene in terms of legislation and standardisation and thereby facilitate the introduction of insect food products. At the same time research and development efforts in different areas should be focused on providing reliable information and innovations and finally an industry needs to exist that produces and offers insect products for food and feed. The three actor groups are clearly interlinked and action by all of them is necessary to drive progress. (van Huis 2013).

Governments have a great power in determining which products can or cannot be sold within the national territory. It is legislation that can create opportunities or barriers for new markets. (Fligstein and Dauter 2007). In Europe, legislation about insects as food is very limited. On the EU level the status of insects as food has not yet been defined. It is uncertain whether or not they should belong to the category of novel foods as there is a lack of information about their use in Europe in the past. (van Huis et al. 2013). Novel foods are defined by the European Commission as "*foods and food ingredients that have not been used for human consumption to a significant degree in the EU before 15 May 1997*" (European Commission 2014). This includes also exotic traditional foods that have been consumed outside of the EU for a long time, which is also the case of varied insect species. If insects should be classified a novel food, they should be regulated according to Regulation (EC) 258/97 that requires an application for authorisation with an extensive risk assessment prior to the introduction of the product in the EU market. This implies a long and cost-intensive application process, with an average procedure duration of 39 months. In addition, the risk of rejection of the application makes the attempt to introduce novel food products even less feasible, especially for small enterprises. (Hermann 2009).

In December 2013, the European Commission adopted some proposals that aim at revising the Novel Food Regulation (EC) 258/97. They suggest to simplify the authorisation procedure and propose special provisions for exotic traditional foods with a consumption history outside the EU. (European Commission 2013). At the moment, however, the lack of clarity about the status of insects and the ensuing lack of regulation seems to be paralysing their development as food in Europe, as investors are reluctant to fund an industry in an uncertain and semi-legal situation (Halloran 2014). Only when their status is defined, it will be possible to develop legislation that

guides the safe mass-production of insects and controls their commercialisation and environmental impact. (Halloran 2014, van Huis et al. 2013).

Some countries have decided to set up their own guidelines until agreement within the EU is reached and common legislation can be applied across borders. Currently, Belgium and the Netherlands have made this step. In Belgium, the Federal Agency for the Safety of the Food Chain (FASFC) authorises the production and commercialisation of 10 insect species including some cricket, locust, mealworm and moth species, by registered producers that comply with safety standards. The producers are required to follow the general food legislation, hygiene standards and labelling requirements with information about what the product contains and where the insect ingredients come from. This special authorisation, however, does not include food ingredients that can be extracted from insects, such as insect protein, and other insects than the 10 listed species. Those remain affected by the EU Novel Food Regulation. (FAVV-AFSCA 2015). In the Netherlands a risk assessment was conducted in October 2014 and three insect species that are available for purchase in the country, namely the mealworm (tenebrio molitor), the lesser mealworm (alphitobius diaperinus) and the locust (locusta migratoria) that are all three also among the Belgian exceptions to the Novel Food Regulation, were recommended to be treated under the General Food Law and are not considered novel foods in the Netherlands (van der Meulen 2014).

In some other EU countries, such as France and the United Kingdom, the commercialisation of insect products seems to be tolerated (van der Meulen 2014). In the United Kingdom, for example, it is allowed to sell insect food products because of the vague wording of the Novel Food Regulation that does not mention insects which is being used as a loophole. However, this is due to change once the regulation is reviewed. (Halloran 2014).

In addition to the country or EU-level, international standards and legislation should be developed to help expand and harmonise the industry on a global scale. Van Huis and colleagues (2013) suggest the inclusion of edible insects in the Codex Alimentarius, the reference for food and feed quality and safety standards produced by the FAO and WHO. Also a regulatory framework produced conjointly by regulators, industry members and consumers could be a valuable tool to make edible insects more trustworthy. (van Huis et al. 2013).

Research is necessary to support the development of a regulatory framework by providing reliable information about potential health and environmental impacts of insect rearing and

products. It is also crucial for the development of new technologies that support mass-rearing of different insect species to make commercialisation of edible insects more economically feasible. (Rumpold and Schlüter 2013, van Huis et al. 2013). Moreover, different functional properties of various insect species should be investigated to determine their potential as food additives and texturisers (Rumpold and Schlüter 2013). Research in this area has so far been neglected, mainly due to the above mentioned Western aversion towards insects as food, and innovations and scientific knowledge in the field are limited, which hinders the development of the industry (van Huis et al. 2013).

Recently, however, the EU has become interested in insects as an alternative source of protein and has invested €3 million in the project PROteINSECT - insects as sustainable sources of protein - as part of the EU's seventh framework programme for research (FP7). Some universities in Europe are integrating the study of insects as food and feed, namely the Laboratory of Entomology at Wageningen University, Netherlands that supports the national legislation on edible insects, and the University of Copenhagen in the Faculty of Science. In other countries around the world, especially where insect eating is more prominent, a number of research centres and a wide variety of courses about insects and insect rearing are available. A lot can be learned from countries where insects are a traditional food and have been cultivated or collected and commercialised for a long time. (van Huis et al. 2013).

Although the legal conditions are unfavourable and research in the field is limited, a number of companies already exist in Europe that offer a variety of edible insect products for human consumption. The majority of them is active in Belgium, the Netherlands, France and the United Kingdom, where the commercialisation of edible insects is currently allowed or tolerated. Also in other countries some industry actors exist that have found a way to work in the given conditions. A selection of the companies are presented in the sample of this study.

Furthermore, within the industry a number of national associations have already formed; so for example the Dutch Insect Farmers Association (VENIK) that was founded in 2008, or the French Federation of Producers, Importers and Distributors of Insects (FFPIDI). Such organisations are important as they have a stronger lobbying and negotiation power than individual producers and can support more favourable conditions, networking and knowledge sharing within and across industries. They can also play a key role in bringing different actors together to develop industry standards that can be used for self-regulation and quality control as long as public legislation is missing or vague. (Halloran 2014, van Huis et al. 2013).

2.3 Sustainability as a driver for business creation

After having gained a better understanding of entomophagy in Europe, it is now interesting to take a closer look at entrepreneurs in this context as creators of companies and new markets. Given the sustainability aspect of edible insects as a protein source in terms of environmental, health and socio-economic benefits of insect rearing and eating that has been discussed thoroughly in part 2.2.1, sustainable entrepreneurship literature is reviewed next to better understand insect food entrepreneurs as sustainable entrepreneurs.

Sustainable entrepreneurship as defined by Patzelt and Shepherd (2011, 632) is "*the discovery, creation, and exploitation of opportunities to create future goods and services that sustain the natural and/ or communal environment and provide development gain for others*." The aim of sustainable entrepreneurship is to create positive outcomes on a triple bottom line - in economic, environmental and social terms. Also environmental and social entrepreneurship aim at tackling sustainability issues, although aiming at a double rather than triple bottom line, choosing to focus on the environmental or social outcome of their enterprise respectively, in addition to the financial one that is the focus of conventional entrepreneurship. (Binder and Belz 2015).

Sustainable entrepreneurship is a relatively new field of study that is still being defined and where research is still limited. Some studies that investigate the individual as a determinant for sustainable enterprise creation and the impact of the entrepreneur on the implementation of the enterprise are reviewed next, as they might give interesting insights relevant for the entrepreneurs of the sample and their insect food businesses.

Patzelt and Shepherd (2011) identify several characteristics of the individual that influence the ability of recognising sustainable development opportunities. According to their research, knowing the natural or communal environment, being motivated for personal gains as well as altruistic reasons and acting in response to a perceived threat in the environment, are all factors that increase the likelihood of recognising a sustainable development opportunity. It is even more likely, if the individual has gained knowledge in the field of entrepreneurship beforehand.

This is in contrast with findings by Kuckertz and Wagner (2010) who investigate a possible connection between an individual's concern about sustainability issues or *sustainability orientation*, and the willingness to start an enterprise. They find that sustainability orientation is positively related to both, the recognition of sustainability-related opportunities and the willingness to take action, but prior knowledge and experience in the field of entrepreneurship

are found to decrease the positive effect of sustainability orientation. Existing research is thus not very conclusive regarding previous exposure to business knowledge, but does find a connection between the sustainability orientation of an individual and the recognition of related business opportunities.

Two further studies find that the entrepreneur him- or herself is determinant in the creation of a sustainable enterprise and the degree of implementation of sustainability principles in new enterprises. Both studies suggest classifications for entrepreneurs depending on their dedication or commitment to sustainability issues, distinguishing between eco-dedicated, eco-open and eco-reluctant, and committed, aware and indifferent entrepreneurs, respectively. The studies suggest that the first group of entrepreneurs takes sustainability issues into consideration from the very beginning of the enterprise set-up, the second group considers only selected issues and the third group does not show interest in sustainability issues beyond compliance with legal requirements (Schick et al 2002, Spence et al. 2011).

The studies mentioned above clearly show that sustainability can be a driver for entrepreneurship that addresses sustainability issues and can impact how a company is set up, choices that determine what is offered to potential customers and how they are reached and convinced of the product. Extant literature, however, gives less insights into this how and only little knowledge is available about how the entrepreneurs create markets for more sustainable alternatives.

One study that investigates the influence of small sustainable enterprises on existing industries has been conducted by Hockerts and Wüstenhagen (2010). The researchers suggest that often small enterprises, called *Emerging Davids*, play an important role in opening up a field for more sustainable practices by successfully implementing radically new and more sustainable ideas that are later adopted by established, big businesses, or *Greening Goliaths*. Small enterprises can thus contribute to the transformation of industries by initiating more sustainable practices. This could be relevant for the sample companies that might have the role of Emerging Davids, introducing insect food products in Europe and starting a transformation of the food industry.

Writing about ecopreneurs, Linnanen (2002) points out that market creation is one of the additional challenges entrepreneurs pursuing more sustainable innovations with their enterprises have to face that are less relevant for conventional entrepreneurs. For ecopreneurs market creation includes raising environmental awareness and legitimation of the cause.

Furthermore, they face additional financial barriers as finding investors willing to fund ventures with strong environmental values who consider potential enterprises trustworthy enough is difficult, and finally the combination of ethical values with business management and efficiency can pose additional difficulties. (Linnanen 2002). However, the paper does not give insights into how these additional challenges can be overcome.

In summary it can be said that sustainability might play a role as a driving force in the insect food industry as it can inspire entrepreneurs to establish businesses that address sustainability issues. However, the literature does not give enough insights into how sustainable enterprises can address customers and create markets for their offer. The value proposition and related company choices might shed light on how it can be done. This is why I present next the business model canvas as a tool for understanding companies.

2.4 The business model canvas as a tool

The companies being the focus of this research, it is essential to understand the way they are doing business and creating the market for edible insects and derived products. Understanding the business model of a company means gaining insights into how a company aims at creating and delivering value to its customers. The choices entrepreneurs take in their business model influence their ability to effectively supply customers with something they value and are thus important when investigating the creation of a market for insect food products.

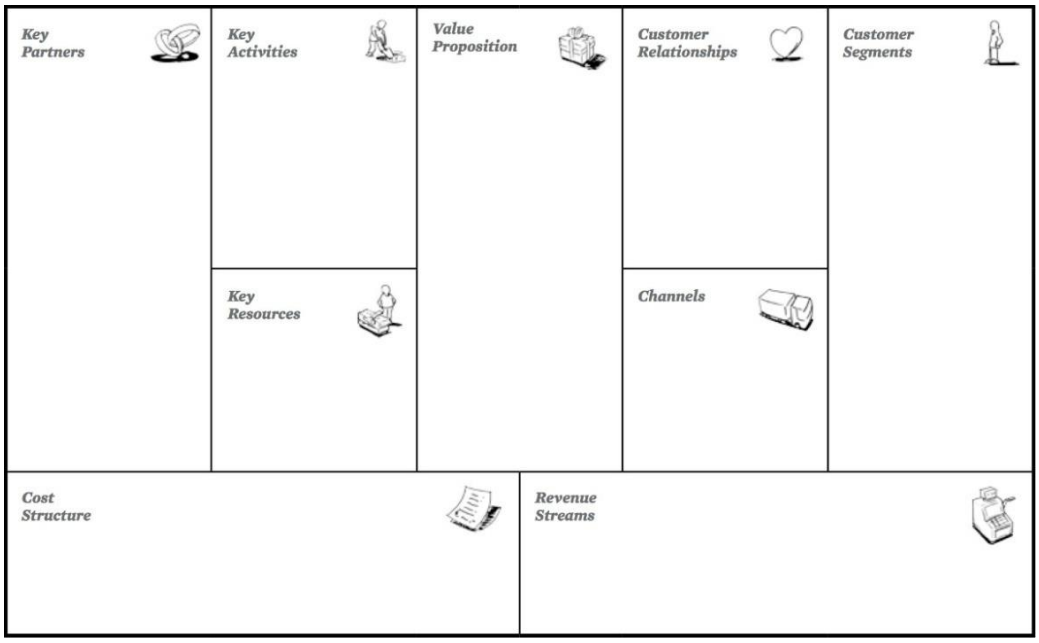
Different authors suggest a variety of tools that help to analyse business models. One of the most recognised and widely used tools is Osterwalder and Pigneur's (2010) *business model canvas* that allows to understand the different aspects of how a business operates and how different elements are related to each other. The idea of the business model canvas is to create a common understanding of what a business model is and to be able to analyse different business models, compare them or look for innovation opportunities in a more intuitive and comprehensible manner. (Osterwalder and Pigneur 2010).

The business model canvas (figure 2) consists of nine key elements:

- customer segments: for whom is value created
- value proposition: what value is created and which consumer problems are solved
- channels: how is the product or service delivered to the customer

- customer relationships: how are relationships with the clients established
- revenue streams: how and what do customers pay for
- key resources: what is needed to produce and deliver the product or service
- key activities: what activities are crucial for the product or service to reach and satisfy the customer
- key partnerships: which partners are needed to make the business viable
- cost structure: what generates the highest costs. (Osterwalder and Pigneur 2010).

Figure 2. Business model canvas



Source: Osterwalder and Pigneur (2010, 44), reproduced online at businessmodelgeneration.com

To clarify the concept of the business model explained above, here a fictive and simplified example: an insect food provider could target the customer segment of young and busy individuals who are not attached to meat and look for easy and healthy food solutions. A ready-to-eat meal with insect ingredients, such as a fresh salad with roasted mealworms offered in supermarkets could be a product that meets the need of this segment. The company could produce salad and mealworms itself, package them and deliver the product to a selection of supermarkets in the area. The production, packaging and delivery as well as marketing activities

would thus be the key activities of the firm. Customer relationships would be of the basic self-service type. The key resources would include a garden and insect rearing facility and equipment for production, a production site where the ingredients could be processed and packaged, and a certain number of employees who perform the activities needed. The different facilities would probably be the most important cost factors and revenue streams would come from the sales of the product. The key partners could be the supermarkets, industry associations and suppliers of packaging.

As an extension of the regular business model for what they call *triple bottom line businesses*, or businesses offering sustainable products and services, Osterwalder and Pigneur (2010) suggest the inclusion of two more elements: social and environmental benefits and social and environmental costs.

2.5 Theoretical framework

In the following I summarise the most relevant aspects of the extant literature that are used to make sense of the data and answer the research question.

For my research I use the business model canvas proposed by Osterwalder and Pigneur (2010) to structure the empirical part, guiding the design of the questionnaire for the interviews as well as the structure of the findings chapter, to gain an overview of how the companies in the insect food sector do business. In order to avoid requesting information that the sample companies prefer to keep secret, some parts are only touched superficially, while the financial aspects have been deliberately left out as they are not of major importance for answering the research question and financial sustainability is an obvious necessity for a functioning business. Also, in the analysis part some aspects have been grouped in order to avoid repetition.

The theoretical framework for the research presented in table 2 shows what should be expected from the case companies as suggested by extant literature for creating a market for their products. Looking at the suggestions with the categories of the business model canvas in mind, it appears that the *value proposition* and *key partners* including customers (*customer relationships*) and distributors (*channels*) as well as related *key activities* seem to be the most important aspects to look at when investigating market creation. Clear suggestions for the value proposition are found in entomophagy and food choice literature where strategies considering

visual and other product aspects as well as different arguments in favour of entomophagy are mentioned. Networking and collaboration are highlighted in both, literature about market creation and entomophagy and can be directly connected with the category key partners and may include the relationship with customers and distributors. Given the importance of communication as well as networking suggested in literature, both might belong to the key activities of the sample companies.

Table 2. Theoretical framework

	ENTOMOPHAGY AND FOOD CHOICE	**MARKET CREATION**	**SUSTAINABLE ENTREPRENEURSHIP**
Main idea	**Information, education, cultural adaptation and exposure**	**Legitimation of activities**	**Sustainability as a driver**
Company level	Communication: different arguments in favour of entomophagy, positive transvaluation Visual aspects: attractive and interesting presentation, invisible insect ingredients, combination with known and liked ingredients Product aspects: competitive price, quality and convenience	Communication: interaction with different stakeholders, discourse and dialogue, persuasiveness Building of trust, reliability and reputation, selection of reliable partners	Entrepreneur's sustainability orientation influences opportunity recognition and realisation of the enterprise
Industry and industry environment	Industry association: lobbying and negotiation, bottom-up creation of industry standards	Collaboration, development of industry standards and norms Industry association for negotiation and reputation building Networking and knowledge sharing with different actors	Influencing industries as successful examples of more sustainable alternatives

The framework is used in the discussion chapter to compare the theory with the findings, determine which strategies are actually applied in the field and how different aspects are being approached by the companies. In this way the research question can be answered, discrepancies between theory and practice can be identified and explained where possible with the collected data, or highlighted as aspects with need for further research.

3. Methodology

After having reviewed the extant literature regarding market creation, entomophagy, sustainable entrepreneurship and possible company choices, next I explain and justify the methodological choices I have taken during the thesis process. First, I shortly remind the aim and context of my research. Then I focus on multiple case study research and the sample for my study. I explain the ontological and epistemological groundings of my study, clarify the data collection and analysis process, and in the last part I consider the trustworthiness and ethicalness of my research.

3.1 Recap of the research aim and context

With my thesis, I answer the question:

How do businesses offering edible insect food products contribute to the creation of markets for entomophagy in Europe?

My goal is to understand how insect food products are turned into an acceptable food choice by European businesses in the sector by collecting different approaches that constitute working examples in this emergent market. Another step in my investigation is to find out which of the strategies identified by scientific research for increasing consumer acceptance of entomophagy are used in practice and how. This allows me to gain insights into market creation for more sustainable novel foods. Furthermore I intend to understand the role that the sustainability aspect of insects plays in the development of an insect food market.

As explained in detail earlier, the research is situated in Europe where the insect food industry is currently emerging. The investigated industry is thus characterised by a limited number of actors who operate in a changing and uncertain environment due to a lack of legislation and research and who face the challenge of convincing European consumers and other actors of the value and legitimacy of insects as food products.

3.2 Multiple case study approach

For this thesis I have chosen to conduct a qualitative research because it is particularly adapted to research in new fields of study where prior research is limited as is the case of entomophagy in Europe. A further reason for conducting qualitative research is its capability of grasping socially constructed meanings and cultural aspects within the research topic. Quantitative research, in contrast, was ruled out because of its strong reliance on a vast amount of data, mainly of numerical nature, and because of its focus on analysing statistics or testing hypotheses. (Eriksson and Kovalainen 2008).

Within the qualitative methods I selected case study research as fit for the purpose of answering my research question that aims at gaining a clear understanding of different case companies and more precisely of how they make insect food products viable in Europe. Yin (2002) highlights the suitability of case studies for answering "how" and "why" questions and cites for example Schramm's case study definition of 1971: *"The essence of a case study (...) is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result."* (Yin 2002, 12). Case study research allows to look at a selected phenomenon, process, actor or situation in detail and to get a holistic picture of the happenings, conditions and relations that are determinant in the case in its specific context (Eriksson and Kovalainen 2008).

In case study research, there are two predominant designs: intensive case study research that looks at one case in depth, and extensive case study research that analyses a selection of cases and attempts to unveil patterns and to capture differences and similarities between them. In the majority of extensive case studies the focus does not lie on the cases themselves but rather on what can be learned from their comparison; the cases are thus not the goal but the means of the research. (Eriksson and Kovalainen 2008).

For my specific study, the extensive case study design is more relevant, as it is not a unique case I am interested in but rather the understanding of how insect food products are introduced in Europe in different ways by actors of the same group. The cases are therefore instrumental in achieving my research objectives and answering the research question. The interest in this particular aspect also implies that the case descriptions put emphasis on features that are closely related with the aim of the research, rather than drawing a detailed picture of all aspects of the cases in question. This is common practice in multiple case study research and although it leads

to the omission of certain aspects and often results in a thinner description than intensive case study research, it allows to look in great detail at the elements that are most relevant for the research at hand (Eriksson and Kovalainen 2008).

While multiple case study research is often brought in context with the development of new theory as suggested by Eisenhardt (1989), it can also be used to shed light on a phenomenon and help its understanding by comparing different cases (Eriksson and Kovalainen 2008). This latter use of the extensive case study approach is applied in my research, as I am not aiming at generating theory but simply on contributing to a better understanding of the various strategies companies in the insect food sector have developed for furthering entomophagy and creating a market for it in Europe.

The role of theory in my research is better explained as a contributor to ongoing reflection. As pointed out by Eriksson and Kovalainen (2008), in case study research data and theory are in continuous interaction throughout the research process and become intertwined. Therefore I used literature from different areas throughout the research process, in an attempt to make sense of the data I collected. The fields that are of major importance for my study are market creation, entomophagy and related literature especially with a focus on Europe or Western societies, sustainable entrepreneurship literature and the business model canvas. The extant literature used for the research is reviewed in detail in chapter 2 of the thesis.

3.3 Case boundaries and case selection

As my research question is specifically questioning how different companies approach entomophagy and help to create the insect food market in Europe, the unit of analysis are the companies themselves. Each case in my research is represented by one company offering insect food products in Europe. The focus lies on company choices in terms of business model choices, activities and communication that give insights into the creation of the market for insects as food in Europe. In order to answer my research question, I include relevant decisions related to the product to be sold, the targeted customer segments, the channels, outreach activities, communication and relationships with customers and partners as well as associations and competitors. Other company decisions and activities that are not directly connected to helping the understanding of how the company brings an insect food product to the target customer and makes it a wanted product, or that are common to most food suppliers, including financial

information are deliberately left out. The cases are delineated in time by the moment the idea for each company came into being to the current state in May-June 2015 when the data for the study was collected. Also visions and planned activities for the near future, the end of the year being the approximate limit, are included. I tried to gather similar data for the different cases studied, as is explained in detail below, so that comparison is facilitated and the trustworthiness of the gained results is increased.

Regarding the selection of the sample, there is a variety of strategies for selecting appropriate cases for an extensive case study research. Case selection is usually guided by theoretical rather than statistical sampling criteria and can be based on theoretical categories that need to be filled, the ability of chosen cases to extend emergent theory, to highlight extremes or typical conditions, or their fit for replicating already studied or selected cases. In addition to theory-related conditions, also practical issues like access to information about possible cases and feasibility of the research in terms of resources such as funding and time need to be considered. (Eriksson and Kovalainen 2008).

In order to find potential sample companies, I conducted online searches with different search terms such as entomophagy, insect producer, selling/buying insects. A valuable source of information was a list of insect food products available in Europe published in February 2015 by 4Ento (4Ento 2015b), a consultancy that aims at raising awareness about entomophagy in Europe and supports entrepreneurs in the field (4Ento 2015a). As the insect food industry is only just emerging in Europe, the number of actors is limited. I identified 22 companies selling insect food products in different European countries with an online presence in English, German or French, languages I speak fluently. The countries with the highest numbers of insect food companies are Belgium, the United Kingdom, France and The Netherlands, whereby some Dutch companies have websites in Dutch only and are therefore not included in the 22 companies found. Also some companies offering technology solutions for insect farming such as Nordic Insect Economy and EntoCube, two Finnish start-ups, were found but not included in the list as they do not sell insect food products in Europe.

To determine the sample companies for my research, I contacted 20 of the identified companies and asked about their interest in participating in the study. As I did not find all companies at the same time, there were three rounds of contacting companies: during the first round in April 13 companies were contacted, in May I contacted four more companies and in June the final three companies. Of the two companies that were not contacted, one did not have any contact

information on the website and the second one was not contacted because it was a Belgian company selling whole dried insects and at the time I found this company, two Belgian companies and two whole, dried insect providers had already agreed to participate in the study and I was hoping to have a more varied sample. In total, I got eight positive replies. However, only six of the eight companies actually found time to participate in the research.

Given the limited number of companies willing and capable of participating, the sampling process had a strong focus on access rather than theory. Nevertheless, all six companies willing to participate were included in the research because they reflect the wide variety of company approaches in the sector, as the sample companies differ in terms of products sold - from whole insects to processed products with invisible insect ingredients, product range - from one specific product to wholesale of a variety of products, channels used - from online shops to local supermarkets, marketing message focus - from sustainability to adventure, and operating country. The different aspects and particularities of each case are presented in chapter 4. It needs to be mentioned that although five of the 22 companies found provide insect flour or powder for use in cooking, none of them were willing to participate and this group is thus not represented in the sample. Neither did any of the companies importing insects from Asia agree to participate in the research. The six case companies that are part of the research are listed in table 3.

Table 3. Selected sample of insect food providers in Europe

Company name	Product(s)	Country	Link to website
Aldento	Fresh pasta with mealworm flour	Belgium	http://www.goffardsisters.com/
Crowbar	Protein bar (Junglebar)	Iceland	http://www.crowbarprotein.com/
Green Kow	Sweet and savoury spreads with mealworms	Belgium	http://www.greenkow.be/EN
Micronutris	Whole insects, appetizers, biscuits, pasta, chocolate and macarons with insect flour	France	http://www.micronutris.com/
Nordic Food Lab and The Cambridge Distillery	Anty Gin	Denmark / UK	http://www.cambridgedistillery.co.uk/antygin/
Snack-Insects	Whole freeze-dried insects: mixed dinner-box, mixed snack pack, tubes with one species, big packs; chocolate and lollies with whole insects; vodka and mealworms	Germany	http://www.snackinsects.com/

Each of the six cases studied is thus a company in the food sector that offers insect food products for human consumption operating from a European country. The sample includes two companies from Belgium, a country representing a distinct legal environment that is different - although only temporarily - from the legal framework of the EU, which the German, French and Danish-British companies operate in. The sixth company in the sample operates from outside of the EU, namely from Iceland.

3.4 Ontological and epistemological perspective

My research is based on the assumptions of social constructionism. In this view, reality and meanings are created through social interactions and are not stable but can evolve over time and depend on the specific context and individual or group. Reality can only be understood through a person and is therefore different for everyone, based on individual interpretations. This is in opposition to objectivism that assumes the existence of a social reality independent of individuals, their actions and interactions between them. (Eriksson and Kovalainen 2008). When applied in qualitative research, the social constructionist perspective investigates how individuals perceive the world and how this perception is formed (Heaton 2004). Particular importance is given to language as a means of sense-making and shaping reality. The way ideas are expressed and meaning is conveyed influence our perception of reality (Eriksson and Kovalainen 2008).

The focus is thus on the actors and their interpretation of reality. How are entrepreneurs in the insect food sector making sense of entomophagy in Europe? How are they trying to influence the meanings given to insects by potential customers? Clearly there are different understandings of what an insect is and whether or not it should be considered food based on individual interpretation. The creation of a new image for insects that pushes them into the realm of food and the creation of a market around novel products containing or consisting of insects is thus achieved through social interaction, language use and the gradual adaptation of meanings.

Also I, as the researcher, influence the results of my thesis as it is my making sense of the collected data, my own interpretation of the material that leads to the results. Thereby my interpretation is influenced by my involvement in entomophagy, growing and eating insects myself as well as by my background as a linguist that influences my understanding, interpretation and translation of the data that was collected and worked with in three different

languages. A different individual conducting the same study might come to different conclusions.

3.5 Data collection

For this thesis, I researched insect food providers in Europe from January to June 2015 and collected the specific materials for the research in May and June 2015. The data comprises primary data that is made up of six individual interviews with one entrepreneur for each company included in the sample and email communications with the interviewees, as well as textual and visual secondary data that is published on the company websites. All these materials, that are explained in detail below and are listed in table 4, are used to construct the cases to be studied. Case descriptions that summarise the relevant information for each case are presented in chapter 4 of the thesis.

Table 4. Data sources for cases studied

Case company	Primary Data	Secondary Data - company website	Secondary Data - other
Aldento	E-mail communication with co-founder	http://www.goffardsisters.com	
Crowbar Protein	Interview with co-founder	http://www.crowbarprotein.com/	
Green Kow	Interview with founder	http://www.greenkow.be/EN	
Micronutris	Interview with founder	http://www.micronutris.com/index.html http://www.mangeons-des-insectes.com/ YouTube videos linked on company website	https://vimeo.com/83674484
Nordic Food Lab and The Cambridge Distillery - Anty Gin	Interview with product development manager	http://nordicfoodlab.org/blog/2014/10/anty-gin http://www.cambridgedistillery.co.uk/antygin/ http://nordicfoodlab.org/blog/2013/5/pestival	http://www.pestival.org/about/
Snack-Insects	Interview with founder	http://www.snackinsects.com/ http://wuestengarnele.de/	

For case study research it is particularly important to use data triangulation - a combination of different types and sources of data that allows to cross-check information from one source with another, as "*case studies are usually considered more accurate, convincing, diverse and rich if*

they are based on several sources of empirical data", so Eriksson and Kovalainen (2008, 126) in Qualitative Methods in Business Research.

For my thesis, the basic information about the businesses can be gathered from existing sources like the websites. This secondary data is interesting because it shows how the companies communicate with their existing and potential customers and can give insights into which aspects appear of particular importance for the communication of insect food products. However, the information available online might lack certain aspects that are crucial to answer the research question. In order to gain more in-depth information and to understand the point of view of the entrepreneur and the reasoning that led to the commercialisation of different insect products in a specific way, interviews are very valuable. Combining the information from the different sources can thus lead to a better and more complete understanding of the cases, allow me to better answer the research question and increase the quality of my research.

3.5.1 Primary data

Primary data is material that is collected by the researcher him- or herself and is therefore tailored to answering the specific research question that is investigated. The most common methods for primary data collection in qualitative research are interviews or focus groups, and observation (Eriksson and Kovalainen 2008).

For my thesis I contacted the six companies and asked for an interview with a person in a position to talk about the insect food business and the reasoning behind decisions taken. As all of the companies are still small, I was able to talk to the founder or one of the co-founders of the companies in five cases and with the product development manager in charge of the insect product for the sixth company. This allowed me to receive information from a person that has been actively involved in the creation and decision making of the company and to gain first-hand insights into the why and how certain aspects are being handled. I conducted guided, semi-structured online interviews via Skype with five entrepreneurs, one per case company. With one case company representative it was not possible to have an interview, therefore two sets of questions were sent by email: a first questionnaire with open and more general questions and a second questionnaire with more detailed clarifying questions. For the Skype-interviews, each entrepreneur was interviewed once for 20 to 40 minutes. The length of each interview was determined by the interviewee's willingness to talk about the company and different choices in

more or less detail. As already mentioned before, the interviews were conducted during a two-month period in May and June 2015.

The questions used during the interviews were mainly open questions that allowed the interviewee to interpret them individually and discuss the most relevant aspects related to it in his or her view. In this way, the researcher bias could be reduced, as guidance towards specific themes was minimised, and the interview structure made it possible to understand the interviewee's interpretation of his or her business and entomophagy at large.

All interviewees were presented a very similar initial question that encouraged them to tell about their business. Specifying sub-questions were asked depending on the information given by the interviewee in order to assure that the research question could be answered and the research objectives could be achieved. The questions were guided by the extant literature reviewed in chapter 2 of the thesis and were organised around the business model canvas suggested by Osterwalder and Pigneur (2010) with a special focus on the value proposition, customer segments and relationships, key resources, partners and channels. For the value proposition also different strategies to increase consumer acceptance as suggested by research about entomophagy in Western societies and the importance of the sustainability aspect of edible insect products were discussed. Sub-questions were also used to assure that similar information was collected from all cases. They were adapted to the specific interview situation and therefore varied in terms of wording and order. This procedure gave me the possibility to take advantage of a dynamic flow of the interview and to collect more in-depth information where necessary.

The interviews were conducted in English, French or German, depending on the preference expressed by the interviewee. In this way, I attempted to make the interviewees feel more at ease in expressing themselves. I transcribed the interviews in the language they were conducted in, and then translated the information that I used for the thesis into English for the German and French interviews. Follow-up emails with clarifications to the interviews were also used as data source and were treated in the same way as the data collected during the interviews.

The primary data collected has some limitations. First, given the openness of the interview questions and the timely distance between the interviews, not all aspects that were brought up by the entrepreneurs concerning a certain topic could be discussed in every interview and therefore not all information is comparable for all the companies. Nevertheless, where

important topics and ideas were introduced later, additional information from already interviewed entrepreneurs was collected via email. Moreover, as only one entrepreneur was interviewed for each company, it was not possible to gain a complete understanding in the cases where the company is run by a founder couple. This, however, is a minor issue as most of the information gathered in the interviews concerned the company in general rather than the personal opinion of the interviewee. In the case of the Joint Venture between Nordic Food Lab and The Cambridge Distillery, the fact that the interview was conducted with the product development manager from Nordic Food Lab leads to a stronger focus on that component of the Joint Venture and neglects the specific view of The Cambridge Distillery. Finally, conducting the interviews in three different languages may have led to misunderstandings or uncertainties in the translation of certain expressions even though no relevant doubts arose during the revision, analysis and interpretation of the data.

3.5.2 Secondary data

Secondary data is material that is already existing, either in written, audio or visual form (Eriksson and Kovalainen 2008). Existing data that was not explicitly produced for research is called naturalistic data because it emerged without solicitation by the researcher. The use of this type of material can pose challenges in terms of data fit, as important information to answer the research question might not be available or the amount and depth of information about different aspects may vary widely between cases. However, the flexibility of qualitative research as well as the possibility of combining secondary and primary data through data triangulation as explained above reduce this problem. (Heaton 2004).

The secondary data used for my thesis is of naturalistic nature and is comprised of information published on the websites and blogs of the case companies. The information available on the websites includes written as well as visual material in form of pictures and videos. This data is valuable because it allows to understand the way the companies communicate to their existing and potential customers and is not influenced by the research. However, the amount of secondary data available varies widely between the different case companies which makes a combination with primary data absolutely necessary to have a more balanced data set, gain a better understanding of each of the cases and answer the research question.

3.6 Data analysis

For the data analysis I followed the process suggested by Eriksson and Kovalainen (2008) that starts with the creation of a case record that brings together all the data from the different sources that is relevant for each case. The next step was to code the interviews as well as the secondary data that I collected, in order to make a systematic analysis of the data possible. For the coding I did not use a preselected set of codes, but an inductive method where the data was the basis from which I developed codes. However, as the interview questions were based on the business model canvas, certain codes reflect those categories. Thereafter, I proceeded with a thematic analysis that allowed me to identify recurring semantic themes related to the research question. I then grouped the codes in the different themes and combined them under the categories of the business model canvas where possible. The final list of identified codes and their characteristics can be found in table 5.

As is often the case in extensive case study research, I first analysed each case for itself, and then conducted a cross case analysis to contrast and compare the different cases. Thematic cross case analysis is very well suited for the identification of similarities and differences between cases. The main concepts gathered from theory such as the business model canvas, sustainable entrepreneurship, market creation and entomophagy research were used as sensitizing concepts and thus helped to frame the analysis. (Eriksson and Kovalainen 2008). Therefore, the data interpretation was guided by the theoretical knowledge collected in the literature review as well as my personal background, as was already explained above.

For the presentation of the findings that were generated in this way, I decided to first describe each case separately in chapter 4 given the considerable differences between the cases in certain aspects, and then proceed to delineating the findings from the cross case analysis in chapter 5. In order to make sure that all relevant information was included, I used table 5 as guidance. In chapter 4, each case description includes general information about the company, such as the operating country and the reason for founding it, details about the value proposition and its most important aspects emphasised by the entrepreneurs including for example the argumentation used for selling, the quality or locality aspect of ingredients etc., information about the channels used, particularly important partnerships for the company, company specific customer segments and relationships where information was given, and a summary of the most distinctive features of each case. The order of information changes from case to case to give the text a smoother flow, make it more varied and thus easier to read. More general information about

Table 5. Codes used for data analysis

Business Model Category // Group Label	**Code Label**	**what it comprises**
Value proposition		how value is created
Argument for entomophagy	environmental friendliness and sustainability	argumentation related to resource use, GHG emissions, efficiency, a better future
	nutritional qualities and health	argumentation related to protein, mineral and vitamin content of insects; insects as a healthy food source
	taste	good taste, flavour potential of insects
	novelty and adventure	interest of insects as food evoked by being new, exotic, adventurous, fun and exciting
	ease and multi-use	easy preparation, different possibilities for preparation
Product range & product design	product	what is offered
	good taste	pleasant taste of the product (not necessarily insect taste)
	appearance	product and packaging design
	visibility of insects	insects are visible in the product or cannot be distinguished
	normalisation	insects as a normal food ingredient in discourse and action
	production	how is the production process
	up value	methods for increasing the perceived value of insects and insect food products
	market value	how the product creates value
Quality & expertise	expertise	conveying a picture of professionalism, use of expertise
	quality	references to high quality of the product or its ingredients
	local / natural ingredients	ingredients are sourced locally, are natural
Innovation	innovation	novelty of the product or process
	experimental for company and/or consumer	experimentation with the product or process, a new experience for the consumer
	learning experience	learning throughout the company and product development
Customer segment	customer segment	who is targeted
Customer relationship	customer relationship	communication and interaction with the client
	customer feedback	clients' reactions to the product reported to the company
	outreach / education	methods to spread the message about edible insects
Channels	channel	where and how the products can be purchased
Key partners	collaboration	close collaboration with different actors
	supply	relation with suppliers
	competition	relation with other businesses in the field
Challenges	difficulties	aspects that complicate business operations and the spread of entomophagy
	critique	critical approach towards other actors, visions or approaches
	needed improvement	aspects that would facilitate the growth of the industry
Future orientation	reason / purpose	why the company is working in this sector; what is the aim
	process	references to the longitude of the process; working towards a vision of the future
Other	people and insects	people's perception of insects in general and as food
	particularity	other interesting piece of information

customer segments, relationships and other partnerships as well as challenges facing the industry, on the other hand, are not included in the single case descriptions in order to avoid repetition as they concern the entire industry and are discussed in chapter 5 where the cases are compared in detail. The group labelled "Others" in table 5 was used in a very limited way in the information presented: some of the particularities were included in the case descriptions where a case specific aspect was mentioned. Most of the information gathered with the codes "People and insects" and "Particularities" were too general or not directly relevant to answering the research question and were thus left out. Table 8 at the end of chapter 5 summarises the information for all the companies and allows for easy comparison. The discussion of the findings guided by extant literature is presented in chapter 6 and is structured according to the theoretical framework presented at the end of chapter 2.

3.7 Evaluation of the research and ethical considerations

As suggested by Eriksson and Kovalainen (2008), qualitative research based on constructivist assumptions is best evaluated following the criteria of credibility, transferability, dependability and confirmability that verify the trustworthiness of the research conducted. I did my best to ensure high transparency of the process of data collection, analysis and interpretation and I put effort in explaining the research step by step to make it possible for the reader to follow and understand the process. As my research is based on the assumptions of social constructionism, I am aware that the interpretation of the data is influenced by my personal view. Nevertheless, my claims are based on the data and are traceable, which makes it possible for someone else to gain similar results. Finally, the congruence of a large part of the findings in this study with previous research in different fields including entomophagy, food choice, sustainable entrepreneurship and market creation, shows the transferability of the results which increases the trustworthiness of the study.

Also ethicalness has to be considered in scientific research. Here a distinction needs to be made between the two types of data that the research is based on, primary and secondary data, as different issues arise for each type. As for the primary data, the interviews were conducted after acquiring informed consent by the interviewees who are aware that participation is voluntary and that the information they provide will be made public. Furthermore, the interviewees agree that the information they provide can be used and their names can be explicitly stated when

relevant. Issues of privacy, confidentiality and anonymity have thus been considered. On what concerns secondary data as well as literature, all the published information used as source and cited directly is referenced following the Harvard reference style in respect of the intellectual property rights.

4. Case descriptions

In this chapter I describe the different cases that comprise my sample one by one. The cases are ordered alphabetically according to the company name. For each case I present a short narrative in which I describe what the company does and point out themes and ideas that are of major importance for the specific case either because they appear to be a peculiarity of the case itself, or because they were emphasised during the interview with the respective entrepreneur. The descriptions are aimed at giving an overview of each case and include information about the company foundation and operating country, the value proposition and interesting details, the channels through which the products are made available and important partnerships, customer segments and specific relationships where information was available according to the codes recovered during the analysis process. The final paragraph of each case description summarises the particularities of the case. More information and a summarising table can be found in the next chapter where the cases are compared.

The information for the case descriptions is collected from the company websites and through interviews with company representatives as explained more in detail in the methodology chapter. Only information that was taken from other sources and direct quotations are specifically referenced in the text.

4.1 Aldento: fresh pasta with mealworm flour made in Belgium

Aldento is a start-up established in November 2014 by Géraldine and Sophie Goffard that produces fresh pasta containing mealworm flour (figure 3). The idea for the business developed after a trip to Benin, where one of the sisters was exposed to edible insects and got excited to introduce this food source also in Europe. The report published by the FAO was a further encouragement to start this business for a more sustainable future.

In order to smoothen the introduction of this novel food in the Belgian market, the sisters opted for the integration of an insect ingredient in an everyday product that is easy to prepare and a part of the normal diet of many. The slogan "*Try before you say you don't like it*" (Aldento 2015) responds to the challenge of prejudice and psychological barriers that affect consumer

acceptance in Europe. The sisters aim at influencing and changing European eating habits and pave the way for a more environmental friendly alternative.

Figure 3. Sophie and Géraldine Goffard and their fresh pasta with mealworm flour

Source: Aldento

"Insects are good, that's all", so Sophie Goffard (Email 1). The taste is thus an important sales argument for the fresh pasta. Emphasis is also put on the naturalness of the product and on the fact that all ingredients are sourced from organic agriculture and also the insects are fed organic vegetables. The company sources the mealworms for the production from rearing facilities in the Netherlands, Belgium and Spain.

Currently, the different types of Aldento's fresh pasta are available in organic stores in Belgium and can also be acquired through purchasing associations in the country. The mealworm enriched pasta is advertised as a solution for everyone to vary and modernise one's diet. Also the environmental aspect is seen as an important motivation for potential customers, as it is for the entrepreneurs themselves. At the moment, the sisters are also engaged in developing dry

pasta with mealworm flour. Once the product is ready, Aldento could start to export and expand its business to other European countries.

In order to reach and convince more clients, the Goffard sisters organise tastings and present a variety of recipes with different preparation possibilities on their website. They are also a member of the Belgian Insect Industry Federation (BIIF) and are eager to collaborate with other actors in the field to further entomophagy in Europe.

In this case, particular emphasis lies on the environmental friendliness of insect protein as a motivator for the entrepreneurs as well as sales argument. Also the integration of the insect ingredient in an everyday product that is easy to prepare and available in organic shops makes it an interesting product that does not disrupt local eating habits and offers a strong convenience aspect in terms of availability in the regular store and preparation. The change in eating habits that is envisioned by the entrepreneurs is thus not related to a new product or dish, but mostly to the acceptance of the insect ingredient as a valuable source of nutrients.

4.2 Anty Gin: Nordic Food Lab and The Cambridge Distillery's gin made with wood ants

Anty Gin, a gin made of wood ants, is the unique and only product of a Joint Venture between the non-profit and open-source research centre Nordic Food Lab in Copenhagen and The Cambridge Distillery, a renowned British gin tailor. The idea of producing this "*new and somewhat different*" gin (Anty Gin 2014), as it is advertised in the press release, arose when Nordic Food Lab was creating a menu for an event called *Exploring the Deliciousness of Insects* held in London in spring 2013 as a part of *Pestival* (Nordic Food Lab 2013), a festival that has the interaction between humans and insects as a theme (Insect Arts Club 2011). After the successful implementation, the two parties, Nordic Food Lab and The Cambridge Distillery, decided to produce Anty Gin as a commercial product.

It is the first commercial product Nordic Food Lab has engaged in producing, being a non-profit research centre, the production of commercial products is not a priority. Anty Gin was launched "*as an exploration of the flavourful potential of ants*" (Interview 1, 2) and to see whether a product like this could succeed on the market. It is thus a product that strongly reflects the way of thinking of Nordic Food Lab that is promoting a different view of insects and their use in

gastronomy: insects as carriers of new taste experiences, as something delicious that should be explored and incorporated into European cuisine because of their distinct flavours. Product Development Manager at Nordic Food Lab, Jonas Astrup, argues that instead of focusing primarily on the potentially good environmental aspects of producing insects for human consumption, deliciousness, comes out as much stronger argument for entomophagy.

The ingredients for the Anty Gin, the wood ants as well as seasonal wild herbs, were foraged locally in the UK by a group of experienced foragers. Also the wheat used for the base alcohol was sourced from organic agriculture in England. The gin was distilled at The Cambridge Distillery one litre at a time, and the labels for the bottles were typed by hand on the distillery's typewriter from 1924. Locality of the ingredients and high quality of the product are of major importance, as is exclusivity: the first batch consists of only 99 bottles. The product includes a 700ml bottle of Anty Gin that is visible in figure 4 and a complementary 50ml bottle of pure wood ant distillate and costs £200 or €250.

Figure 4. The design of Anty Gin reflects its high quality and evokes the insects that give the liquor its special taste

Source: Nordic Food Lab

The first batch of Anty Gin was advertised with a press release that was sent to selected media as well as directly to "*hand-picked*" restaurants and bars (Interview 1, 6), using mainly established contacts of The Cambridge Distillery. Purchases can be made through The Cambridge Distillery's online shop that was already existing. As the customer feedback was good, the Joint Venture is currently preparing the production of a second batch. The possibility of selling this second batch exclusively in two selected supermarkets in London is being discussed. In this way, the Joint Venture hopes to reach out to more people, even though the product is still not aimed at the masses.

In this case, the product itself is quite distinctive: being a liquor clearly separates it from the other cases that are focused on food rather than beverages. Other particularities that characterise this specific case are the exclusivity of the product that is to be seen as a luxury beverage that is not targeted at the broad masses but rather at high-end bars and restaurants where something unique and different is valued; and the strong emphasis on the specific insect flavour that brings the value to the product. Also, it is a peculiarity of this case that neither Nordic Food Lab nor The Cambridge Distillery depend on the success of the insect product for their existence; it is rather an extension of their work or offer and has been approached as an opportunity for experimentation.

4.3 Crowbar Protein: Junglebar - an Icelandic protein bar with cricket flour

Crowbar Protein is a young Icelandic company that specialises in research and development as well as marketing and sales of products with insect ingredients. It was founded in 2014 and has launched its first product on Kickstarter in April 2015. The Junglebar, an "*insect powered protein bar*" (Crowbar Protein 2015) that contains dates, cranberries, a variety of seeds and cricket flour was successfully pre-financed through the campaign and will be produced and available for sale online and in retail stores by the end of this year. The packaging of the product is depicted in figure 5.

The company sees great potential in insects as food ingredients due to their high nutritional value. Producing insect food products is at the same time a challenge and an opportunity: people

in the Western world are still to be convinced that insects are a legitimate food source and at the same time many are intrigued to try something new. Without the cricket flour, there would be no need for Junglebar to exist; the novelty factor of insects as an ingredient makes it interesting. Crowbar Protein hopes to build on this interest generated by the newness of insect foods in Western cultures and presents Junglebar as a fun and exciting product that is the foretaste of all the possibilities that open up when insects are introduced as a food ingredient. "*Our bars are a gateway product into the field of edible insects*", so Búi Adalsteinsson (Interview 4, 3), co-founder of Crowbar Protein.

Figure 5. Packaging of the soon available Junglebar produced by Crowbar Protein

Source: Crowbar Protein

The mission is to normalise edible insects in the Western world and Crowbar Protein is convinced that the best way to do that is through the right product. The taste and looks of the product have to be convincing, otherwise people will not want to overcome the barrier of disgust towards insects. It should look and taste like any other protein bar, with the difference that the protein source for the bar is more exciting than in usual bars, as already explained above.

Transparency and information are very important to the team as they believe that by explaining why it is desirable to eat insects and how their protein bars are produced, they are able to

convince people to try their product, which is a first step to eating insects in the future. The company blog lets people take part in the development of Crowbar Protein and its products. The team is actively promoting insect eating in general by holding informative lectures and sampling sessions to give people the chance to understand and try insects as food. Furthermore, the company is part of an Icelandic organisation that promotes the use of insects and insect products not only as food but also as feed, for medicinal purposes and other uses. Being part of an industry that is just emerging, Crowbar Protein embraces other insect projects and rather than seeing them as competition, they are regarded as support, furthering the same idea and helping to spread it in the Western world.

The case of Crowbar Protein is unique in this sample because the production of the first batch of the Junglebar protein bar has been funded through a very successful crowdfunding campaign. It is also special because the company has been actively engaged in creating a market for its products before even finalising the first product that will be available only at the end of this year. The information gathered for this case reflects thus the pre-launch experience of the entrepreneurs. An interesting aspect of the approach taken by the company is that it attempts to normalise insect ingredients by making use of their novelty factor, which appears to be a somehow paradox approach.

4.4 Green Kow: Belgian savoury and sweet spreads containing mealworms

Figure 6. Green Kow's savoury mealworm spreads

Source: Green Kow

Green Kow is a Belgian start-up that was founded 3 years ago, because the founders believed that if insects should become the food of the future, the time to act had come. In order to produce their savoury and sweet spreads with mealworms in a very professional way from the very beginning, they started to look for experts to partner with. The recipes for the spreads are created by a Belgian two star chef, and the mealworms are sourced from controlled insect farms in Belgium and the Netherlands to assure quality and further reduce the environmental impact that is already low compared to other animal protein production, by also reducing the transport distance.

Green Kow offers four varieties of mealworm spreads: the savoury versions feature tomato and carrot and the sweet spreads dark or milk chocolate, each with 5% of mealworms. The spreads that are visible in figure 6, are available in selected organic grocery stores in Belgium, as well as in the outlets of the Belgian supermarket chain Delhaize where they are sold under the supermarket's own insect food brand name *Green Bugs*. Green Kow was the first company in Europe to offer insect food products in organic shops and is now also a pioneer in large supermarkets. By offering Green Kow products directly in shops and supermarkets, the consumer effort to get to insect food products is minimised as they are available in the usual store.

It is the mission of the company to bring insect food products into people's lives and make insects a part of European eating habits. Therefore, the first priority is to create a tasty and easy product that can be enjoyed with family and friends and can serve as a discussion starter. For this initial product the company has chosen to reduce the visibility and insect-specific flavour to a minimum, as the product is aimed at helping people to overcome their fears and to realise that insects are edible and can be considered a normal food ingredient. Green Kow envisions that future products will contain more insects and aid the gradual normalisation of insects as a food ingredient. The company embraces the entry of competitor products into supermarkets to increase visibility and attract more attention for insect food products as the idea is to make insects a lasting food ingredient rather than a short-lived fashion.

The first and foremost argument for the consumption of Green Kow's products has to be the taste, as people will not eat something that does not taste good although it might be nutritious and good for the environment, so the founder Damien Huysmans. Therefore, the good taste of the product is the first sales argument, followed by nutrient content and environmental friendliness given by the insect ingredient.

What stands out in this case is the strong focus on normalising insects as a food ingredient that is reflected in the offer, where the visibility and taste of the insect ingredient is minimal, as well as in the channels chosen for the commercialisation of the product that is available in a number of regular stores. The change effort for the consumer is minimal, the product is designed to fit into the eating habits of the Belgian population where different kinds of spreads are often consumed as an appetizer on toast.

4.5 Micronutris: from insect rearing to the commercialisation of processed insect food products in France

Micronutris is a French company located near Toulouse that was founded in 2011. After starting several businesses, the founder Cédric Auriol was eager to launch an activity that would take into consideration the pressing issues of our time. After reading the report by the FAO encouraging the spread of insects as a protein source, he decided to establish the first edible insect farm in Europe producing insects exclusively for human consumption. Today Micronutris produces approximately one tonne of insects a month, including mealworms and crickets, and is in the process of being ISO 22000 certified, to further increase the credibility of the company and emphasise the high quality of its products.

Next to rearing insects and selling them alive or in dehydrated form mainly for use in gastronomy and confectionery, Micronutris has also developed a number of insect food products based on insect flour. As insect food is a new market, the challenge is to develop products that are adapted to the expectations of European customers and facilitate the acceptance of insects as food. Therefore, Micronutris offers sweet and salty biscuits with cricket and mealworm flour and has recently developed pasta with a percentage of insect flour for the larger public. Those products fit the usual eating habits of the French population and play on common looks with enhanced nutritional qualities due to the insect ingredient. In the same line of food products with invisible insect ingredients, energy bars are currently being developed. The products that are represented in figure 7 are available for sale online, on the company's webshop called *Mangeons Des Insectes (Let's eat insects)* and in delicatessen grocery shops in France.

Figure 7. Micronutris' products include whole insects and processed products containing insect flour

Source: Micronutris

Next to rearing insects and selling them alive or in dehydrated form mainly for use in gastronomy and confectionery, Micronutris has also developed a number of insect food products based on insect flour. As insect food is a new market, the challenge is to develop products that are adapted to the expectations of European customers and facilitate the acceptance of insects as food. Therefore, Micronutris offers sweet and salty biscuits with cricket and mealworm flour and has recently developed pasta with a percentage of insect flour for the larger public. Those products fit the usual eating habits of the French population and play on common looks with enhanced nutritional qualities due to the insect ingredient. In the same line of food products with invisible insect ingredients, energy bars are currently being developed. The products that are represented in figure 6 are available for sale online, on the company's webshop called *Mangeons Des Insectes (Let's eat insects)* and in delicatessen grocery shops in France.

The company's stance on insects is that they should be considered as a valuable food option because of their great nutritional qualities and healthiness as well as their very low environmental impact compared to traditional animal production. Micronutris emphasises the high quality of its products, the locality of the resources used, as the feed for the insects is locally sourced from organic agriculture, as well as the zero waste objective of the on-site production of its insects. The focus on sustainability that was already important for the creation of the company is clearly visible.

In order to spread the message and increase the prominence of edible insects in Europe and mainly in France, the company engages in a variety of activities. Micronutris has participated in numerous trade fairs and exhibitions and is very active in social media as well as regular media. The creation of videos about the business and the appearance of the company in different media channels and TV shows and reports are an integral part of the communication strategy. Furthermore, the company has added outreach activities to their offer: a one-hour conference called *And if we ate insects?* as well as animations and tastings with information about entomophagy, display of live edible insects and the possibility to try whole or processed insects as food can be requested on the company website.

Being a pioneer in the field, the company had to develop the needed knowledge and expertise for the production and processing of insects internally as there was very little knowledge available externally. It was and continues to be a learning experience. The company's internal research team plays a big role in the development of the company. Automatising the production is one of the priorities of Micronutris, as this will allow to reduce the costs of insect production that are high due to its labour-intensity, and in this way lower the price of edible insects and insect food products.

This case is special because the company engages in rearing insects for human consumption and uses the own production as raw material for processed products that are being developed. Micronutris has thus complete control over most of its value chain on what concerns the insect ingredients. The strong emphasis on environmental friendly production methods and local, organic feed for the insects is interesting. Furthermore, Cédric Auriol attaches great importance to the learning experience he and his employees have gone through and the fact that needed expertise has been generated internally.

4.6 Snack-Insects: freeze-dried whole insect products in Germany

Snack-Insects was founded at the beginning of 2013 by Folke Dammann in response to the FAO's appeal to Western countries to consider insects as a viable food choice. The young entrepreneur saw the potential of insects as a sustainable food source and started to develop a business around it. Today, Snack-Insects is the largest edible insect provider in Germany and offers a range of freeze-dried, whole insects for cooking purposes that come in different package sizes, savoury and sweet seasoned insects as snacks, *Junglate* - chocolate with mealworms, lollies with different insects and vodka with mealworms. The insects are sourced from controlled European insect farms. In this way the quality of the products can be assured.

The wide product range attempts to cater for a variety of clients: while the main target customer group are people who cook with insects, the snacks and sweets as well as the smaller sized packages are intended for people who would like to try insects as something new and adventurous. Moreover, Snack-Insects offers bigger bags of freeze-dried insects for use in gastronomy and supplies restaurant chains and catering firms in Germany and Austria with edible insects. The products are available for purchase on the company's online shop and through resellers such as Globetrotter.

In order to encourage people to cook with insects, Snack-Insects' website and the Facebook page feature insect recipes and advice on how to prepare insects in different ways. In addition to the information that is available online, Snack-Insects has been working on developing an insect cookbook that was published in August 2015. For the insect products and the cookbook it was a priority to make their appearance appealing, showing that edible insects are a delicacy. The presentation of the products has to reflect their high quality and convince the consumer of the legitimacy of insects as food.

The publication of reports, news and informative articles about eating insects in the media triggers an increased demand for Snack-Insects' products as well as press inquiries. The increasing media interest in the topic of entomophagy has the result that Snack-Insects is often mentioned in press releases and the business is going well. Also the participation in events to present Snack-Insects products belongs to the regular business activities of the entrepreneur (figure 8).

Snack-Insects is a pioneer in the field and hopes to lead the way to a more sustainable future by reducing the barriers of disgust built through enculturation in Western societies. Eating insects

Figure 8. Folke Dammann presenting Snack-Insects' products

Source: Snack-Insects

being something completely normal in many parts of the world, it just does not make sense to refuse the practice in Europe. The founder sees enormous potential in using insects in the industrial food production and believes that his clients today will be open towards products that contain insects in the future.

In this case the insects are whole and clearly visible in the product; most products consist entirely of whole insects that need to be prepared or processed by the clients themselves. Compared to other cases that offer ready-to-eat products, Snack-Insects' cooking insects require more action on the consumer side. The communication of the products is somewhat paradoxical - while the main idea is to use them for cooking as a delicacy, as is supported by the nice packaging, and normalise them as a food ingredient in the long run, the main message in the online shop seems to be that insects are adventure food and require braveness to be eaten. It is also very interesting that the main motive for the entrepreneur to found the company appears to be sustainability related, as he is convinced that from an environmental and nutritional point of view, insects should be used as a protein source in the future.

5. Findings

After giving an overview of each case company and its particularities, in this chapter I explain in detail what findings my interviews and secondary data revealed that give insights into the market creation for edible insects in Europe as it is being advanced by entrepreneurs in offering insect food products. Some aspects are characterised by unanimity while others demonstrate a wide variety of options on how to perceive entomophagy and build a business around it.

The chapter is structured following the groupings of the different codes derived from the data analysis which leans on the business model canvas suggested by Osterwalder and Pigneur (2010) that were presented in table 5 in the methodology chapter. Some aspects have been grouped to avoid repetition: the suppliers are not mentioned in the key partners but are highlighted in part 5.1 with regards to the quality requirements for the resources. This is also where key resources are discussed. The key activities flow in throughout the chapter and information regarding the financial aspects has deliberately been left out as financial details are not directly relevant to answering the research question. At the end of the chapter, table 8 summarises the most important information for all the cases.

5.1 Value proposition

The value that insects can bring as a food ingredient is clearly reflected in the argumentation for insect food products and the variety of approaches taken by the case companies. In addition to the difference in communicating the value of insects as food, the case companies offer different products and do also have differently sized product portfolios. Their value propositions differ greatly from a special treat for connoisseurs to an everyday product with a known taste and an invisible extra ingredient. What all the companies agree on, however, is the need for high quality and expertise to be trustworthy and accepted, as well as the importance of innovativeness for their products.

5.1.1 Argumentation: Why should Europeans eat insects?

The case companies use different arguments to convince potential consumers of the value of their product: emphasising the taste of their products is an important sales strategy. Also the

nutritional and environmental aspects are often mentioned. Other arguments in favour of edible insect products that are brought forward by some of the case companies are the newness and adventure related to eating insects as well as the ease of preparation and multitude of possibilities when cooking and eating insects.

It is important to mention that all companies combine different arguments to reason for entomophagy in Europe. Each company has selected a few specific arguments that represent its main argumentation strategy. A summary is presented in table 6 below. The first priorities are highlighted in bold. These selected arguments are strongly reflected in the discourse the companies are choosing to communicate about insects. The message is often adjusted to the interlocutor, as Folke Dammann (Interview 3, 3) from Snack-Insects points out: "*Of course it depends who is being addressed*." Additionally, three of the companies have a separate section on their websites where they answer the question why to eat insects and give a multitude of reasons backed by scientific research. In the following, the different argumentations are explained in detail one by one.

Table 6. Main argumentation for entomophagy

	taste	**nutrition & health**	**environmental benefits**	**adventure / fun / modern**	**easy & versatile**
Aldento	**good taste**	important	important	modern, alternative	fast preparation, many possibilities
Anty Gin	**insect taste**	-	not priority	-	-
Crowbar Protein	good taste	important	not priority	**fun, exciting**	-
Green Kow	**good taste**	important	important	-	-
Micronutris	good taste	**important**	**important**	new, unusual	sweet and savoury recipes
Snack-Insects	insect taste	important	important	exotic, modern	easy preparation, sweet and savoury recipes

Main argument highlighted in bold.

Taste

Being in the food and beverage industry, the taste is obviously an important aspect when trying to convince consumers of one's product. All companies agree that a pleasant taste is crucial. For Anty Gin, Aldento and Green Kow the deliciousness of their product is the main message

to the consumer. What does differ, however, is the idea of what should bring the dominant flavour to the product.

Anty Gin is currently the sole advocate in the sample in favour of highlighting the specific flavour of the insect ingredient. Thus, the wood ants give the liquor not only the name but also the special flavour and customers receive a complimentary bottle of pure ant distillate so that they can experiment themselves with the tasty ingredient. This is in line with Nordic Food Lab's approach to researching the flavour potential of insects to increase their value for use in gastronomy and is highlighted strongly through the language that is used in the press release that advertises the product: "*Through distillation of these wood ants we explore the tasty universe of these naturally occurring molecules and reactions, capturing the flavours of this fascinating species*." or "[...] *share our excitement for the unique flavour of the Formica rufa*" (Anty Gin 2014). It is also interesting to note that not only the taste but also the animals themselves are highly valued and are referred to as a "*fascinating species*" or "*inspiringly sophisticated creatures*" (Anty Gin 2014).

Snack-Insects advertises a "*new taste experience*", with insects being a "*gastronomic insider tip*" (Snack-Insects 2015b). And the Goffard sisters point out: "*Insects are good, that's all*! *You have to try to have a personal opinion and drop the prejudice*" (Email 1). On the website they describe the taste of their mealworm infused pasta as being similar to cereal or whole grain pasta. They encourage their customers to give the pasta a chance and try it before they decide not to like it.

The insect flavour is not particularly highlighted by the other companies. On the contrary, Green Kow and Crowbar Protein point out that the taste of the insect should be minor, while other ingredients should be dominant and give the product a good taste. The mild taste of the cricket flour used for Crowbar Protein's bars offers the opportunity to add insect proteins and take full advantage of the known and liked tastes of the other ingredients. The limited amount of mealworms in Green Kow's spreads should encourage people to try and find out that it is not a big deal to eat insects. The customers are invited to "*enjoy the delicious*", "*culinary art*" that is intended for "*lover[s] of fine tastes and all good things*" (Green Kow 2015). Those first spreads taste mainly of tomato, carrot and chocolate and the most important thing is that they taste good. In future products, so the founder, the amount and prominence of the insect ingredient in the product can be gradually increased.

Nutrition and health

The nutritional qualities and related health benefits of eating insects are the most often stated argument. The nutritional aspect is so important, because people get increasingly interested in the nutritional qualities of what they eat, so Green Kow founder Damien Huysmans.

With exception of Anty Gin, which is a quite unique and different product, all companies highlight the protein content of their insect ingredients and advertise the insect protein as an alternative to conventional animal proteins. Aldento, Crowbar Protein and Snack-Insects also emphasise the vitamin and mineral content and Micronutris points out the quality of the Omega-3 fatty acids in its insects. Four of the six case companies explicitly highlight the health benefits related to those nutritional qualities. For Crowbar Protein the nutritional aspect is already mentioned in the company name and indeed the young team is eager to develop a variety of products enhanced with insects that "*are a genuine superfood*" (Crowbar Protein 2015).

Environmental benefits

Another argument that is also often stated in relation with insects as a protein source is their environmental friendliness in comparison to conventional livestock production. The lower environmental footprint is mentioned by five of the six companies, however, they use it to different degrees to communicate the value of their products.

Micronutris, for example, is established around sustainability principles and adds to the environmental friendliness of insects in general by using organic feed and having a zero waste goal for the production line. Also animal well-being is mentioned explicitly as an important aspect in their production.

For Green Kow, environmental friendliness of insects is third on the list of arguments that speak for entomophagy; the taste and nutritional qualities occupy places one and two respectively. In a very similar approach, Aldento also puts the taste first but highlights also the environmental friendliness and nutrient content arguments.

Snack-Insects sees the sustainability of this protein source as crucial for the success of insect food products in the future, and acknowledges that it is a valid argument for certain customers. Information about the environmental efficiency of insects is mentioned on the website.

Crowbar Protein, on the other hand, prefers not to emphasise the sustainability argument all that much: "*it can become very sentimental when we start reasoning for sustainability*" (Interview 4, 2); so rather than discussing the need to use less resources for a sustainable future, they talk about insects being exciting and fun. Nevertheless, on their website resource efficiency is mentioned as one of the reasons for eating insects.

A special case is again Nordic Food Lab that is actively trying to change the discourse in favour of entomophagy by making insects all about their flavour and deliciousness rather than their benefits for the planet. Therefore, it is not surprising that the sustainability argument is not mentioned in the case of Anty Gin.

On the side of social sustainability, the potential of insects for contributing to global food security is mentioned by two of the six companies.

Other arguments in favour: insects are fun, modern and easy to prepare

Insect food is something new, something different and that makes it interesting. Crowbar Protein is using the novelty factor to increase the interest in their product. Their message: "*it's exciting to eat insects!*" (Interview 4, 2). This is also conveyed in their product that is appositely called *Junglebar*, an exciting and fun entomophagy experience. Also Snack-Insects uses the exotism and adventure of eating insects to gain customers. In Germany, the TV show *I'm a celebrity..get me out of here!* has created a hype around eating insects that is reflected in the company's online communication: product names like *Jungle meal* and *Junglate* try to convince "*brave tongues*" (Snack-Insects 2015a) to try insects. Next to it being exotic, Snack-Insects is also talking about entomophagy as a new trend that is being discovered in the fashionable restaurant world. Micronutris encourages restaurant owners to try a new and unusual ingredient. In the same vein Aldento invites customers to modernise their eating habits.

The argument that insects are easy to prepare and versatile in their use is mainly used by companies with a variety of insect food products, offering also whole insects that can be further processed by the consumer. "*The preparation of insects is very easy and versatile – sweet and savoury snacks can be prepared effortlessly*" (Snack-Insects 2015c); Snack-Insects and Micronutris both highlight the easy preparation and suggest savoury and sweet preparation possibilities or ready-to-eat products that fit easily into people's lives. The Goffard sisters advertise the fast preparation of Aldento pasta and suggest a number of creative recipes. Also

Crowbar Protein points out the vast amount of possibilities that insects offer as a food ingredient, as an argument to convince people to try and eat insects.

5.1.2 Product range and product design

A wide variety of products is offered by the case companies. While Anty Gin, Aldento, Crowbar Protein and Green Kow focus on one single product type, with some of the products being available in different varieties, Snack-Insects offers a number of products with whole insects and Micronutris has a wide range of products with different positionings for the various product lines.

The majority of the case companies is offering processed insect food products with invisible insect ingredients. In this way they hope to reduce the psychological barriers and make it easier for people to make their first steps in entomophagy. "*It would be a pity to miss out on insects just because we don't like their appearance*", so Sophie Goffard (Email 1) from Aldento. Five of the six companies offer products that incorporate insect ingredients into common products. This is a way to facilitate the introduction of insect ingredients into European eating habits. While Anty Gin is clearly emphasising the particularity of taste of the insect ingredient, as already mentioned before, the four others are using the normality of their product appearance and also the dominant taste of the other, non-insect ingredients as a method to convince their customers. Snack-Insects and one line of Micronutris' products are using a different strategy with clearly visible, whole insects. The positions of the different products and product lines offered by the sample companies in terms of prominence of taste and visibility of insect ingredients is visualised in figure 9 below.

Figure 9. Prominence of insect taste and visibility in products

Crowbar Protein Green Kow Aldento Micronutris processed food	Micronutris chocolates and macarons decorated with whole crickets	Snack-Insects Micronutris whole dehydrated insects Anty Gin

invisible / minor taste ←----------→ high visibility /strong taste

Green Kow is offering mealworms as part of a spread with a familiar taste and look that can be consumed as an appetizer to fit easily into people's normal lives. In this way, the step needed to introduce insects into the daily diet is small. "*We must trivialise things [...] this means, making things as normal as possible*." (Interview 2, 2) The strategy is thus to have a first product where the insect ingredient is invisible and also the taste is nearly unidentifiable in the preparation. In the following products the amount and prominence of the insect ingredient in the product can be gradually increased until insects have become a normality in the European kitchen.

The same strategy is pursued by Aldento integrating the insects in fresh pasta that is fast to prepare and Crowbar Protein that points out the importance of having a product that is just like other protein bars except for the insect ingredient. The insect ingredient is then used in the marketing strategy as a source of excitement and fun, as already mentioned in 5.1.1.

The range of products offered by Micronutris calls for a binary strategy: Micronutris' processed product line combines known ingredients and flavours such as tomato, lemon or chocolate with invisible insect ingredients in products like sweet or salty biscuits or pasta. For the energy bars that are currently under development, Cédric Auriol points out that it is essential the insect ingredient is invisible to convince the consumer of the quality of the product: "*When you see worms in a bar you tell yourself, wait maybe there is a problem with the conservation*" (Micronutris 2013b). A particularity of Micronutris' offer are chocolates and macarons that contain insect flour and are decorated with one whole cricket each. They try to combine the known with the different and make the insect ingredient more explicit. The company is also offering a line of whole, dehydrated insects that can be enjoyed as they are or used for cooking purposes and are commercialised as something different for everyday use with an emphasis on their nutritional qualities and environmental friendliness.

Similarly to Micronutris' whole insect line, Snack-Insects is offering whole, freeze-dried insects where the insects are completely visible. Some products combine insects with known ingredients and flavours such as chocolate, salt, curry or barbeque and are advertised as an adventurous eating experience that should encourage people to have a first and maybe second try. The idea is that after being exposed to edible insects as something exciting and different, they would then get interested in using insects more seriously in the kitchen. The main products of the company are plain freeze-dried insects for cooking purposes that need to be further processed by the customers. Those should be seen as an ingredient for common use, yet of high

quality and value. Their ease of preparation and versatility in use is emphasised through sweet and savoury recipes available on the company website.

Finally, Anty Gin is positioned as a unique and special product for connoisseurs and enthusiasts who are willing to pay for a high quality specialty gin. The value of insects as flavouring ingredient is emphasised and insects are presented as a culinary treat that should conquer the bars and kitchens through their special tastes.

An important tool used for communicating the value of edible insects is the packaging of the products. Snack-Insects points out that the packaging was carefully designed in a way to convey the value of the insect products as gourmet foods: "*Especially with this kind of product it is important to make sure from the beginning that it is not only of high quality, but also presented in that way*" (Interview 3, 3). Also Anty Gin pays special attention to communicating the value of the product through the packaging with hand-labelled bottles that are designed to evoke the insects that are at the basis of the beverage.

5.1.3 Quality and expertise

It is clearly noticeable that quality and know-how are of major importance for all the case companies. In an emerging industry, the companies have to appear as professional actors with high quality products and sufficient know-how to gain the trust of the consumers and with it the acceptance of the new products.

The quality of the ingredients and raw materials used in production as well as of the products offered by the companies is repeatedly mentioned in the interviews with the company representatives and on the company websites. Because of its great importance, the companies look for reliable suppliers mainly in Europe to source the ingredients for their products. In most cases short supply chains in terms of geographical distance as well as number of intermediaries, and organic production are chosen.

To emphasise a high quality, Anty Gin points out that the ingredients for the gin are collected locally in the wild by a group of "*wild plant specialists*" and are seasonal; for the base alcohol "*100% organic grown English wheat*" is used (Anty Gin 2014). Also Micronutris attaches great importance to the high quality and locality of its raw materials and products: the feed for the insect production is natural and derived from organic agriculture in the region. On the website the consumer is informed "*Insects fed and grown with passion in the South of France*"

(Micronutris 2013a). Aldento highlights that all raw materials are chosen with care and pasta ingredients as well as mealworm feed are from organic agriculture.

Green Kow and Snack-Insects emphasise the importance of having European suppliers for edible insects that can assure the quality of the product because they run controlled rearing facilities following standards that ensure the insects' adequacy for human consumption. Snack-Insects highlights that the insects undergo a microbiological analysis every three months. And Green Kow has established good relations with local insect producers and visits them to get updates on the production. The fact that the insects are edible and produced explicitly for human consumption is repeated several times by Green Kow, Micronutris and Snack-Insects.

The quality of the products offered by the companies is not only influenced by the raw materials used, but also by the expertise the company is able to acquire. By forming a Joint Venture between Nordic Food Lab and The Cambridge Distillery, Anty Gin is able to use the expertise of both partners - the research on entomophagy and experimentation on taste by Nordic Food Lab and the knowledge and equipment for professional gin production by The Cambridge Distillery.

When it comes to professional production techniques and facilities, both Crowbar Protein and Green Kow point out that it was important for them to move the production into professional facilities and collaborate with experienced actors. "*To convey the image [...] we are not amateurs, we are not producing in a kitchen, we are really producing very professionally in serious facilities*", so Damien Huysmans (Interview 2, 1) from Green Kow.

For Micronutris it was essential to develop knowledge and expertise inside the company as not much expertise about insect production for human consumption was available externally when the company was starting its operations. The company's internal research team has played a vital role in the successful development of the company. For the development of their processed insect product line, Micronutris is collaborating with companies specialised in food production.

Also other companies have chosen to seek the support of experts to develop their products. Green Kow and Crowbar Protein, for example, work with outstanding chefs to develop the recipes for the products, Aldento collaborates with chefs and delicatessen store owners to create interesting recipes for their customers and Snack-Insects is collaborating with an art director to produce a convincing and appetizing insect cookbook.

Finally, being a leader in the industry is actively communicated by Micronutris and Green Kow. While Green Kow highlights being the first provider of insect food products, first in organic shops and then also in supermarkets in Europe, Micronutris points out that it was the first company in Europe to have its own insect rearing facility to produce edible insects exclusively for human consumption and is currently in the process of obtaining an ISO 22000 certification which will make it the first insect producer worldwide with this certification.

5.1.4 Innovation

Next to quality and expertise also innovation and offering an innovative product is a recurring element in the interviews and on the websites of the case companies. The introduction of insects as food in Europe needs experimentation from the companies as well as from the consumers.

The case companies highlight the innovativeness of their products, using insects, a so far "*unexploited protein source in Europe*" (Micronutris 2013a). At Micronutris the innovation is double-fold: the production of innovative products containing insect ingredients is made possible by a new way of insect rearing that has been developed by the company.

In the press release for Anty Gin it is highlighted that the Joint Venture between Nordic Food Lab and The Cambridge Distillery was formed "*in the spirit of innovation*" with the aim of creating "*a new and somewhat different gin*" (Anty Gin 2014) that explores the specific taste of wood ants.

With their products, the companies invite their clients to experience something new and to experiment with the new food ingredients that are now also available in Europe. Aldento points out that their product is "*an invitation for discovery*" (Email 1), and that "*daring the diversity leads to beautiful discoveries*" (Aldento 2015). And Micronutris offers products that are "*ideal to let your close ones discover entomophagy*" and invites the clients to "*let your imagination guide you cooking them*" (Micronutris 2013a).

5.2 Customers and channels

Defining customer segments and choosing channels accordingly to bring the product to the consumers is fundamental for the success of the business. The case companies have opted for different distribution channels to reach consumers. In terms of customer segments, the major

task is the expansion of the audience willing to consider insects as food. In order to create and expand the market, the companies engage in a variety of activities.

5.2.1 Customer segments

Introducing insects as a food ingredient that is not yet well accepted in Europe, the case companies are trying to determine who the customers with the best prospects are.

For Anty Gin, Nordic Food Lab and The Cambridge Distillery have contacted selected high-end restaurants and bars, mainly in Europe, but also in the USA and some other countries. "*People who we thought could or would believe that this product could be interesting to have in their bar or maybe some of them at homes or in restaurants*" (Interview 1, 5-6). Because of the high price of the product, the possible market for it is reduced.

The other companies seem to keep their options wide open and try to appeal to different customer segments. Some of the processed insect food products are targeted at the general public. Here, certain characteristics determine who is more likely to consume insect food products. People who care about the environment are mentioned by four companies as a group with particular potential. Also being a gourmet and being curious and open to try new things are mentioned several times as factors that increase the interest in insect food products. Green Kow points out that, amongst others, the degree of education influences the openness towards insect food products, rather than a person's age. Other characteristics associated with a higher openness towards or compatibility with entomophagy mentioned by the companies are the wish to diversify one's diet or to find an alternative protein source and a focus on a healthy lifestyle.

Next to people who use insects for cooking purposes, Snack-Insects is also actively targeting people who want to try insects for fun and for excitement, maybe as a test of courage, a joke or as an inventive gift. Also in this line, companies are offered customised edible insect products as advertising material.

Another customer segment that is sought after by five of the six companies, including Anty Gin that has already been mentioned before, are restaurants. Micronutris and Snack-Insects with their whole insects intended for further processing have a particular focus on this customer segment, supplying also catering firms and in the case of Micronutris confectioneries, and are targeting also companies in the food industry.

Green Kow, Aldento and Micronutris are specifically targeting retailers, namely organic shops and delicatessen stores that might be interested in their products. As Green Kow points out, they started with organic shops because they thought that their products were best adapted to that kind of retailer and they would find strong support, but they realised that was not really the case: "*Sometimes it works, sometimes it doesn't work. [...] I would say that maybe the organic stores have become now, they are not hippies anymore, they have become merchants, real merchants. That changes a bit how they approach things*." (Interview 2, 3). Maybe even more unexpectedly, Green Kow's products have been able to enter the Belgian supermarket chain Delhaize.

5.2.2 Customer relationships

A specificity related to the newness of insects as food in Europe, is that the existent market for insect food products is small and needs to be actively expanded. The different potential customer segments need to be convinced of the legitimacy of insects as food. That is why, next to their regular business activities, the sample companies engage in a variety of activities to spread the idea and raise awareness.

All six companies appear to be very active in communication and outreach activities of different kinds. As Crowbar Protein puts it: "*[...] our biggest mission is to get this idea out there"* (Interview 4, 3) and indeed all of them seem to agree. The young companies are very present in the media: they appear in newspaper articles, TV shows and are often cited as experts in the field. All of them organise or participate in tastings and gastronomic events, they are present at fairs, exhibitions and entomophagy events. Most of them hold educational lectures or info sessions. "*Consumers need to be introduced and informed about the origins, rearing and processing methods. They listen, and after they try they approve*" (Email 2). Micronutris estimates to have been present at several hundred events during the four years of its existence and to have interacted with over 500,000 people in this way. And Snack-Insects has added a special t-shirt to its product range so that clients can show what they are eating and spread the word.

Green Kow points out that next to the end consumers, it is absolutely necessary to convince the retailers of the value and quality of the products on offer. As the company is relying on third parties to reach the consumers, a lot of effort has been put in conveying an image of professionalism to the retailers. Also Snack-Insects is happy that in the last months it has been

able to gain the interest of several retailers for its products. Crowbar Protein, on the other hand, has not experienced the need to argue for its product with retailers yet, on the very contrary, the company has been approached by supermarkets that are interested in selling the protein bars in Europe once they are ready.

Also online, all the case companies are very present with company websites, newsletters, blogs and on different social media. Facebook and Twitter are used to communicate with clients and to share information about the company activities, entomophagy in general and to give advice on how to prepare edible insects. On their websites, three of the companies offer additional information on entomophagy and also three of them have a section dedicated to recipes with insects or processed insect food products. Snack-Insects, Aldento and Micronutris invite consumers to upload photos of their dishes and share their favourite insect recipes, and Crowbar Protein is using its blog and newsletter to keep potential customers informed about the development of the company and its products.

5.2.3 Distribution channels

So far, three of the six case companies have chosen to make their products available for purchase on online sales platforms. Two companies have created their own online shop, and Anty Gin is being offered through the already existing online shop of The Cambridge Distillery. Next to its own online shop, Snack-Insects is selling its products also through online retailers such as Globetrotter.

Micronutris has opted for combining online sales through their own online shop *Mangeons Des Insects (Let's eat insects)* with sales through delicatessen shops in France. The next step will be to enter the distribution network for organic foods and maybe also supermarkets in the future. Also Crowbar Protein is considering two complementary distribution channels with protein bars available online by the end of the year and probably also in supermarkets in Europe and maybe in the USA.

Green Kow and Aldento, on the other hand, have chosen to distribute their products exclusively through stores. The products of both companies are present in organic shops in Belgium. Green Kow's spreads are also available in supermarkets of the Belgian chain Delhaize and Aldento's pasta can be purchased through purchasing associations. The shops are chosen to facilitate the introduction of insect food products into people's lives and increase the convenience: the

products should be available "*in the current store, not that they have to drive 10 or 20 kilometres or go into a very small shop without parking or that is expensive*." (Interview 2, 8).

At Anty Gin, the possibility of selling the second batch exclusively in two supermarkets in London is being discussed: "*It is a way to hopefully reach out to more people and it's also a way to [...] give those two supermarkets that chose to buy a batch exclusivity*" (Interview 1, 4).

Both, Micronutris and Snack-Insects directly supply restaurants with their edible insects. Their products can therefore also be enjoyed after a further processing step in selected restaurants in France, and Germany and Austria respectively.

Table 7 summarises the distribution channels through which the case companies have chosen to make their products available for purchase.

Table 7. Distribution channels used by sample companies

Online		Retailers			Direct
direct	retailer	organic or delicatessen shops	supermarket	purchasing associations	gastronomy and industry
Anty Gin Micronutris Snack-Insects Crowbar Protein*	Snack-Insects	Aldento Green Kow Micronutris	Green Kow Crowbar Protein (?)*	Aldento	Anty Gin Green Kow Micronutris Snack-Insects

*planned for the end of 2015

5.3 Key Partners

In this emergent industry, the case companies often rely on the knowledge of experts and the support of other actors to succeed. That is why they collaborate with actors within and outside the industry to take advantage of needed skills, resources and expertise, and spread the idea of entomophagy more effective and convincingly.

5.3.1 Collaborations and partnerships

The sample companies engage in a variety of collaborations with different actors to further their cause and ensure their success. The most obvious example is the Joint Venture between Nordic

Food Lab and The Cambridge Distillery for the production and commercialisation of Anty Gin, where the insect product depends on the inputs and expertise of both parties.

Some other sample companies have turned to experts in different fields to get support in the development and production of their insect food products and to convey an image of professionalism. Three of the six companies are supported in the production by professionals with expertise and facilities and two of the companies collaborate with renowned chefs for the development of their products. Also Aldento is collaborating with chefs and gourmets and is proud to present their delicious pasta recipes to their consumers. Finally, Snack-Insects has sought the help of an art director for the realisation of its insect cookbook.

When it comes to innovation, research and development, three of the companies are collaborating with universities and research centres to foster research and development in the field. And also three collaborate with institutions that further innovation and the formation of businesses around innovation. Quite obviously all of the sample companies are open to participate in studies as the one that is being conducted for this thesis.

A special kind of collaboration can be found in the case of Crowbar Protein: the first production round of their product Junglebar is being financed through a crowdfunding campaign on Kickstarter. The team was able to convince 648 people of their idea and exceeded the financing goal by large, raising 180% of the amount initially aimed for.

5.3.2 Other actors in the field

As the insect food industry is just emerging, the number of actors in the field is limited and competition is not strong yet. Búi Adalsteinsson (Interview 4, 3) from Crowbar Protein points out: "*This is such a young field and small industry, I really embrace any project that has to do with edible insects as it's promoting our way of thinking*". Other actors in the industry are thus seen as fellow campaigners rather than competition. Also Micronutris agrees that currently everyone is working in the same direction, developing the market which results in healthy relations between the different actors. "*We know that we can have a stronger positive impact if we work together rather than everyone on their own*", so Sophie Goffard from Aldento (Email 2). Green Kow is looking forward to having more insect food products in the supermarket as it will increase visibility and attract more attention. The aim is to have a shelf dedicated exclusively to insect food products, so the founder.

5.3.3 Associations

In some countries, associations that promote insects in different ways have been established. Crowbar Protein is part of an Icelandic organisation that promotes the use of insects in various ways. Within this organisation the company is collaborating with bee farmers and producers of insects for feed to further the use of insects in different fields, be it food, feed or medicine.

In Belgium, the Belgian Insect Industry Federation (BIIF) aims at uniting actors that breed and use insects for commercial use (BIIF 2015). Aldento is part of the organisation and hopes that it can support industry development by representing the sector in negotiations with authorities and by encouraging collaboration between the entrepreneurs. However, Sophie Goffard laments, the association is not very active at the moment as the members' first priority is setting up their businesses. Green Kow has chosen not to participate because when the company was founded, Green Kow was one of only two active insect businesses, while other people were mainly talking about doing something. The participation did thus not appear to generate value for the company: "*It does not seem interesting for us to be only with people who want to do something. Rather, there should be an association with people who are already doing something, and then we could share opinions, problems and see what we can do together*" (Interview 2, 7). Today the actors on the Belgian market do not only lack time to meet and discuss, but they are also hesitant to share information, so Damien Huysmans.

Also Micronutris has chosen not to participate in the national association as the association that has been formed in France is not very serious and does not support the same values as the company that wants to offer healthy, safe and environmental friendly insects: many of the association members import insects from Asia where traceability is reduced and the long transport distance reduces the environmental benefits of insect production. In Germany, there is no association promoting entomophagy or the use of insects and therefore also Snack-Insects is not a member of any association.

5.4 Challenges

The companies are facing a number of challenges that are mainly related to the newness of insects as food in Europe. Legislation, consumer acceptance and the creation of a new business

in an emerging industry are the aspects in which the entrepreneurs are facing the most difficulties.

5.4.1 Legislation

One of the major issues mentioned by all the company representatives is legislation. Although they operate within different legal environments in their respective countries, they are all affected by the lack of clarity in EU regulation about insects as food and feed, as it reduces the possibilities for marketing their products in different countries and thus reduces the current size of the market that is reachable. In some countries, such as Germany, the production of edible insects is not allowed, which has forced Snack-Insects, for example, to turn to edible insect suppliers in other European countries. The current legislations are incomplete and confusing and create an environment that does not favour the development of the industry because of the high uncertainties current and potential entrepreneurs have to face.

Furthermore, in this situation more effort is required to convince public entities of the legitimacy of the products. In order to be able to sell insects for human consumption in Germany, for example, it is necessary to provide evidence of the origin of the insect ingredients and follow the existing legislation for food products. Given the newness of the products and market and the lack of specific legislation in most of Europe, "*that means it is necessary to argue for the products, show documentation and reports and so on, in order to prove that this is not a jungle camp challenge on a grand scale but that we are in the food business*", so Folke Dammann (Interview 3, 2) from Snack-Insects. Also Crowbar Protein is facing the challenges related to legal uncertainty: "*We have been in good relations with the office of food regulations in Iceland and they have been very lenient towards research and development about insects because we haven't started selling insects out of stores yet. We will find out soon in what way they will react when we apply for sales permits, when we apply for production permits*" (Interview 4, 2).

The companies are convinced, changes in regulation will determine the future of entomophagy in Europe, although at the moment nobody can tell how it will develop. "*If it becomes a centralised process and there is a unanimous decision across Europe, so that you know if you are permitted to sell in one country there will not be any major difficulties selling in others, that would really help the industry to grow and would open up more companies to look into this field*" (Interview 4, 1).

Anty Gin is facing a different legal issue: regulations for importing liquors to the United States are very strict, and that is why potential customers from the United States would have to buy the beverage in Europe and transport it back themselves. The insect ingredient has not caused any difficulties for selling the product so far.

5.4.2 Consumer acceptance

Another difficulty that needs to be tackled by the industry actors is the prevailing perception of insects. "*Of course it's very tricky to get people to eat something they don't regard as food or think it's disgusting*" (Interview 4, 1). But the companies are optimistic that "*this simply arbitrary, culturally acquired disgust [...] can be changed again over time, so that people don't perceive them immediately as pests*" (Interview 3, 3).

As with other products, not everyone can be convinced: a market study conducted by Micronutris shows that similar to the market for oysters and snails in France, approximately 20% of consumers are completely rejecting insects as food. For the remaining 80%, the market needs to be built up, the image of insects reshaped and products need to be developed that meet the expectations of European consumers. Most of the companies have chosen to design their entry-level products to be very similar to known products with an appealing appearance and taste that fit easily into European eating habits, in order to ease the transition from disgust to acceptance.

The experiences and the customer feedback in the sales of their products and when engaging with people in a variety of activities to raise awareness about entomophagy have been good. "*It's really surprising how willing people are to listen and to actually have a taste [...] If I could sit down with every person in Europe and every person in the States I think I could convince most of them to at least have a taste*", so one of the Crowbar Protein co-founders (Interview 4, 4). And attitudes towards entomophagy are already changing, as an experience of Green Kow clearly demonstrates: "*Two years ago we were participating in a fair, a gastronomic event here in Belgium called Culinaria, we were having a tasting stand and the people were asking 'Why should we eat insects?' Now, two years later [...] the question was not why, but how - are they eaten as a whole, should they be visible in the food? It has changed.*" (Interview 2, 5).

A specificity that is pointed out by Nordic Food Lab as a challenge regarding the image of insects is changing the discourse from presenting insects as interesting mainly because of their environmental friendliness and potential to eradicate hunger to arguing in a way that is more

effective in convincing Europeans. For this, Anty Gin emphasises the insect taste, while other companies that are also critical about the persuasiveness of the sustainability argument have chosen to emphasise the nutritional benefits and the good taste of their products in general, as well as the adventurous aspect of eating insects as has already been explained in detail previously.

5.4.3 New industry, new business

Being part of an emergent industry and being young businesses, creates a number of challenges for the sample companies. They have set up or are setting up production, supply and distribution channels and have been developing products, some of them prototyping and testing different versions, determining the packaging, setting the price, all this within a supporting industry environment that is still very limited. This journey has been and continues to be a learning experience for all of them.

Crowbar Protein mentions that just like for any other start-up it is difficult to be the newcomer where established actors already sell similar products - protein bars without insect ingredients - and to set up distribution and logistics from zero. Also Green Kow had to find reliable partners for production and distribution and not all experiences were good. Especially when looking for distributors, the company realised that even many organic and eco-shops are not willing to try new and different products in spite of their strong value in terms of sustainability. Aldento shares this experience and is aware that distributors see a certain risk in offering insect food products that makes them hesitant.

According to Green Kow, distributors in Belgium are still seeing insect food products as a means to attract media attention rather than a serious alternative protein source; therefore they do not take their responsibilities in spreading the idea of entomophagy to the extent they should. Also the small amount of insect food products currently available in supermarkets and smaller shops in Belgium results in a limited visibility that makes it difficult to attract the attention of potential customers.

As pioneers, the companies have to balance what is still missing in the industry environment. Micronutris points out the lack of existing expertise when the company was founded: "*The first difficulty was to put in place the rearing facilities and production because as it is still a relatively new business we had to develop a lot of expertise internally as there was no existing expertise*" (Interview 5, 2).

In addition to the lack of expertise, limited research in the field is slowing down the development of the industry. Two of the entrepreneurs point out that scientific research is not very advanced yet in the field and often they have already figured out themselves what is later published in research papers. Also supportive technologies that would be needed to improve insect production and reduce the costs are yet to be developed. Currently, edible insects and therefore also processed products with insect ingredients are very expensive which makes it more difficult to reach larger customer segments and to turn insects into a food ingredient for regular consumption.

5.5 Working towards a more sustainable future

Edible insects are being held high as a sustainable animal protein source for the future. The entrepreneurs of the sample are clearly motivated by the sustainability aspect of what they do and are willing to invest time and resources now to reach their goal in the future.

5.5.1 Sustainability: a motivation for entrepreneurs

Although the sustainability argument that highlights insects' environmental efficiency and potential to be a major source of sustainable animal protein in the future, is not actively communicated by all the companies as explained in the first section of this chapter, and even though it is certainly not the only argument in favour of entomophagy, it does play an important role in the development of the industry as a motivation for entrepreneurs to start an insect food business.

Three of the entrepreneurs in the sample mention that the FAO report on edible insects that encourages Western societies to embrace insects as a food source has been a crucial factor in their decision to start their businesses. Two more companies were founded with the vision of insects as food of the future.

Many business choices reflect the importance of environmental friendliness and sustainable production for the entrepreneurs: Four of them have chosen to source their ingredients from organic agriculture and five of the six companies emphasise the importance of the locality of their ingredients, which for most of them means products from their country or region and in some cases includes also neighbour countries. Also the choice of retailers with a focus on organic foods is in line with this way of thinking.

The wish to offer an alternative to conventional animal protein sources, is mentioned explicitly by five of the six entrepreneurs. The complete substitution of meat, however, is certainly not their aim; on the very contrary, as Cédirc Auriol points out in a TV-coverage of Micronutris: "*Producing insects we are not saying that from tomorrow we will only eat insects. What we are saying is that producing insects is also a solution to continue eating steaks tomorrow*" (Micronutris 2014).

The entrepreneurs appear less aware about the positive social impacts of their businesses. As mentioned before, two companies highlight their responding to pressing global issues, opening the way for insects as a contributor to food security. Only one of them mentions the creation of jobs and economic growth as positive impacts of the business. For Anty Gin, the social impact lies in raising awareness about the flavours of insects. Also the nutritional qualities and related health benefits of insects as a food source could be seen as a positive social impact, however none of the companies highlights this connection.

5.5.2 Paving the way to a more sustainable future

The entrepreneurs are convinced of the potential insects have as a sustainable protein source and are willing to be part of the transition towards a more sustainable future. How they are taking part in the transition has been explained in detail in this chapter with different strategies and argumentations to convince customers of the value of insects as food, collaborating with various actors and actively communicating and educating about entomophagy.

The entrepreneurs are also aware that this is only the beginning and that the introduction of edible insects into Western food habits will take time. The products offered by the companies are designed and/or communicated to be "*gateway product[s] into the field of edible insects*" (Interview 4, 3). The companies are already envisioning and developing future products that will bring them and their clients a step further towards making entomophagy a normality in Europe.

5.6 Summary of the findings

The following table summarises the findings of the cross-case analysis and gives an overview of the most important information for each case.

Table 8. Summary of information relevant for each case

	Aldento	Anty Gin	Crowbar Protein	Green Kow	Micronutris	Snack-Insects
Value proposition						
Argument for entomophagy	good taste; environmental benefits; nutritional values; convenience	flavour potential of insects	fun, excitement, novelty; nutritional benefits; good taste	good taste; nutritional benefits; environmental benefits	nutritional and environmental benefits	taste experience; novelty; easy preparation and versatility; environmental and nutritional benefits
Product range	fresh pasta with mealworm flour	99 bottles gin with wood ant distillate (700ml) and complementary 50ml pure ant distillate	Junglebar: a protein bar containing cricket flour as protein source	savoury (tomato, carrot) and sweet (dark and milk chocolate) spreads with 5% mealworm ingredient	whole dehydrated insects, appetizers, biscuits, pasta, chocolate and macarons with insect flour (insects produced in-house)	whole freeze-dried insects: mixed dinner-box, snack pack, tubes with one species, big packs, chocolate and lollies with whole insects, mealworm vodka
Quality & expertise	traditionally made pasta; ingredients from organic agriculture; insects fed with organic vegetables; naturalness of product;	ingredients: locally foraged ants and seasonal herbs; organic English wheat; careful distilling process one litre at a time, hand-labelled bottles; expertise of Nordic Food Lab and The Cambridge Distillery; professional foraging group for ingredient collection	professional production facilities; recipe creation in collaboration with Icelandic chef; minimally processed cricket flour; insects as superfood	professional production facilities; controlled European suppliers for insects produced for human consumption; emphasis on organic and natural food; recipe creation in collaboration with Belgian two star chef	controlled, animal friendly insect production exclusively for human consumption; insect feed from local organic agriculture and zero waste objective; being ISO 22000 certified; traditionally produced processed products in collaboration with experts; emphasis on naturalness and locality of ingredients; generation of expertise internally	insects from controlled European suppliers produced exclusively for human consumption
Innovation	mealworm flour as an alternative protein source	experimentation with insects for use in gastronomy	cricket flour as a new source of protein	first provider of insect food products through organic stores and supermarkets; insects as food of the future	pioneer with innovation efforts in large scale insect production for human consumption; products using insects as an innovative protein source	new taste experience; insects as protein source of the future
Customer segment	everyone wanting to vary their diet and aware of environmental issues	mainly high profile restaurants and bars	people interested in a healthy and good nutrition	everyone willing to try something new; gourmets and environmentally aware; gastronomy and retailers	the general public; gastronomy, industry and retailers	people cooking with insects regularly or for fun; gastronomy, industry and retailers

Customer relationship	interaction on social media; transparency; promotions and tastings; publication of customer recipes	press release; use of existing contacts in bar and restaurant world	transparency and extensive online communication as well as outreach activities (lectures, tastings..)	participation in events and trade fairs; organisation of tastings	strong media and social media presence; participation in events and trade fairs; organisation of tastings and information events	strong media presence and interaction on social media; organisation of tastings
Channels	organic stores, purchasing associations	online shop of The Cambridge Distillery; possibility of selling second batch exclusively in two London supermarkets	online sales planned; possibility to also sell in supermarkets	organic stores in Belgium; supermarket chain Delhaize; directly to gastronomy	own online shop; delicatessen stores in France; directly to gastronomy and industry	own online shop; online retailers; directly to gastronomy and industry
Key partners / Collaborations	Boost-Up/Industries Créatives - Creative Wallonia; suppliers; BIIF; chefs and gourmets for recipe creation	Nordic Food Lab, The Cambridge Distillery, Forager	partners for production and recipe creation; Kickstarter campaign; Startup Reykjavik, The Icelandic Center for Research and The Innovation Center Iceland; Icelandic organisation for promoting the use of insects	Investors and partners for production; suppliers; Belgian chef	Midi- Pyrénées Innovation, Agri Sud-Ouest Innovaiton, ctcpa; partners for production of processed products; collaboration with universities and research centres; media	suppliers; gastronomy actors; media; publishing house and art director for cookbook
Challenges	regulatory requirements for food production; unclear legislation about insects as food in Europe and resulting uncertainty	high price of final product; import restriction to the United States	psychological barriers towards insects on the consumer side; issues related to setting up a new business in a still small market; uncertainty due to lack of clear legislation; lack of research; high cost of insect ingredient	high cost of insect ingredient; lack of action by retailers who are not approaching insects as a serious food ingredient yet; small volume and reduced visibility of insect food products in stores	establishment of insect rearing and production facilities with little external expertise available; high production costs; unfavourable legislation in Europe; meeting needs of an emerging market that is still small	issues related to lack of clear legislation and newness of market
Future orientation	introduce a more sustainable protein source and change the eating habits of Europeans	promote a new and different way of thinking and talking about as well as using insects in gastronomy	normalise insects as food ingredient in the Western world and exploit the potential of insects as food source	normalise insects as a food ingredient in Europe and contribute to making them a part of the European diet	create appreciated and accepted insect food products to promote a more sustainable diet	reduce psychological barriers and contribute to spreading insects as a protein source in Europe

6. Discussion

In this chapter I look at the findings from the case comparison presented in chapter 5 and at the extant literature reviewed in chapter 2 and summarised in the theoretical framework. To answer my research question, I discuss the different strategies and methods the companies use to create and shape the market for entomophagy in Europe.

I first discuss the companies' communication strategies as a means for persuading different stakeholders and legitimating their activity. Then I look at outreach activities including networking and collaboration with different actors that allow the entrepreneurs to build trust and a good reputation, both essential for market creation. I shortly examine what role sustainability plays in market creation for insect food products and finally I present two main strategies reflected in distinct business model choices that are used to address different customer segments and build up a market for entomophagy in Europe.

6.1 Communication as a tool for persuasion and legitimation

As the literature in market creation as well as entomophagy and food choice research suggest, communication is a highly valuable tool for persuasion, increasing legitimacy and consumer acceptance.

Given the multitude of arguments in favour of entomophagy it is not surprising that the case companies use a combination of those arguments to convince customers and other stakeholders of the value of their products. Looking at the cases, it appears that personal arguments like the good taste or nutritional qualities of the product, the convenience in terms of ease of preparation and versatility are put in front. The strategy of emphasising the personal benefits, has been found to increase the success of new products in research about food choice where researchers talk about positive transvaluation when good taste and health benefits of novel foods are emphasised (Martins and Pliner 2005). In their study, however, the researchers pointed out uncertainty about the validity of the findings regarding novel foods perceived as disgusting (Martins and Pliner 2005). Given the positive results the sample businesses are achieving, it might be possible to confirm the validity with research about edible insects.

The presentation of insects as a novelty, an adventurous, fun and exotic food, can be seen as a method to increase the interest in edible insects, another strategy that is used for novel foods to increase the willingness to try and decrease the adverse effects of neophobia (Martins and Pliner 2005). Both, the emphasis on personal benefits and the approach of insects as something fun and exciting can also be seen as ways of framing in an appealing and convincing manner, as was mentioned in market creation literature to be crucial for legitimating new activities and consequently for the success of businesses in new markets (Aldrich and Fiol 1994).

It appears that sustainability is used as an additional argument to give more legitimacy to the products. This is interesting and will be discussed further below, as the companies show a strong awareness of sustainability issues and commitment to having a positive impact, yet decide to focus their communication on different aspects. It is also worth mentioning here that in terms of sustainability communication the environmental benefits are highlighted much stronger than the positive social implications of entomophagy although the social contribution could be valuable when arguing for the legitimation of the products especially on the state level where a positive contribution to the health of the population could be appreciated just as much as the environmental benefits of edible insects.

The case companies have chosen different discourses about insects that reflect their sales strategies and are often addressed to a specific group of potential customers. Communication adapted to different groups is mentioned as important by Verbeke (2015), in order to address the specific expectations and views about entomophagy and get through to different customer segments. The variety of approaches can therefore be seen as valuable for the creation of a broader market and for expanding the influence of insect food products because people with different opinions and needs are addressed. Furthermore, the variety of discourse chosen, from insects as valuable carriers of flavour over fun food to sustainable protein sources, can influence the dominant culture and facilitate the introduction of insects into European eating habits, which in turn, can have a positive effect on the global use of insects in the long term, as suggested by entomophagy research (Looy et al. 2014, van Huis et al. 2013). The case companies clearly have this long-term vision of change.

In addition to the above mentioned argumentations used to increase the desirability of insect food products, the high quality of the ingredients and end-products as well as professionalism and expertise appear to be of major importance in the quest for legitimating insect food products according to the empirical findings. Offering a high quality product is mentioned as important by all the case companies and in most cases organic and local ingredients are used. Professionalism in this context engenders giving the insect food business the priority and producing according to high standards of

technology and hygiene, which, like expertise, is often achieved through collaboration with experts and reliable partners as will be discussed more in detail below. Those arguments are used as a means of persuasion and legitimation of insect food products not only among consumer as suggested by Lensvelt and Steenbekkers (2014), but also for gaining the support of retailers and the state.

6.2 Building trust and reputation through networking and collaboration

For new industries, associations can play an important role for networking, reputation building and advancing and spreading ideas with stronger negotiation power, and are therefore held high in literature about market creation for increasing legitimacy (Aldrich and Fiol 1994) and in entomophagy research as a means for influencing legislation and promoting conjoint learning (Halloran 2014, van Huis et al. 2013). The current research shows that in Belgium, France and Iceland associations that promote the use of insects in different forms exist; however, the success seems limited at least within the studied sample. The critical approach towards those associations by three of the four sample companies that operate in countries where a national association has formed, shows that the existence of an association alone does not create value for the industry.

The main issues raised by the companies are an incompatibility in values between the association and the company and a lack of action and willingness to share information among the members. One company that has chosen to participate in the association regrets that the members lack time to create a real identity for the association and set up activities. An exception is the Icelandic organisation for the promotion of the use of insects. It appears that this rather open approach that encourages the participation of actors from different backgrounds and with distinct agendas, does encourage the exchange of information although the value of this information for the advancement of the insect food industry in particular cannot be determined. Nevertheless, it might be that at the beginning a more open association that unites different actors involved in the use of insects as is the case in the Icelandic association, represents a stronger support for the new industry as it allows for shared responsibilities with actors who have established businesses, in bee keeping for example, and who are willing and able to dedicate more time to the association, creating a framework for joint learning also for the entomophagy businesses.

The role of associations seems thus less important in this sample than extant literature would suggest, and although the case companies value the efforts of their comrades and see them as support, working towards the same goal rather than competing with each other for market share, joint action is limited.

Increased activity on the industry level and a stronger collaboration with other industry actors for stronger negotiation power, reputation building and the creation of industry standards by the companies themselves, as is mentioned in market creation and entomophagy literature (Aldrich and Fiol 1994, van Huis et al. 2013) could be considered by the companies to further industry development and increase the chance and speed of legitimation of their activities.

Collaboration with actors outside the insect food industry and up and down the value chain, on the other hand, is practiced and highly valued by the sample companies. As mentioned above, quality and expertise are important arguments for the legitimation of the products. In order to increase their credibility, the companies partner with experts like chefs and the food processing industry to professionalise the production process and gain access to needed skills and resources. Also the selection of trustworthy suppliers of alimentary raw materials including edible insects in most cases, appears important.

For the companies offering their products through retailers, agreements with delicatessen and organic shops are prevalent, which reflect the quality of the products and might have a positive impact on the reputation of the companies. Also supermarkets are being considered and here the convenience and normalisation aspects are even stronger than in specialised shops and can be used as legitimation arguments. The agreement of one of the case companies to sell its product in the Belgian supermarket chain Delhaize with the supermarket's own brand can be interpreted as a first step towards influencing the industry to become more sustainable, where a big company adopts innovative, more sustainable products from a successful start-up and becomes a Greening Goliath, as suggested by Hockerts and Wüstenhagen (2010).

Consumers are seen as important collaborators in spreading the message of entomophagy as well, and the companies are aware that their existing and potential customers need guidance for an easier adoption of their novel food products. This is why next to product-specific information and persuasion efforts, all the companies engage in a variety of activities to spread the word about entomophagy and actively create a market for their products which is an integral part of their business operations. This is often the case for environmental enterprises according to Linnanen (2002) as they face the additional challenge that the market for their products is still small or does not exist. They are present at events, information sessions and tastings, appear in different media, and carry out a number of more basic activities including the publication of detailed information and preparation instructions for their products on their websites. Some of the sample companies also encourage consumers to share their experiences and ideas on how to prepare the products in an effort to expand the available

knowledge and increase legitimacy through the publication of positive opinions and experiences of peers. This highlights on the one hand, that the combination of information, education and exposure that has been found to be essential to increase consumer acceptance of insects in Europe (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, Looy et al. 2014, Tan et al. 2015, van Huis et al. 2013, Verbeke 2015), and the strategy of actively engaging with stakeholders to legitimate a new market activity (Aldrich and Fiol 1994) on the other hand, are being practiced by the case companies.

6.3 The role of sustainability

Sustainability could be seen as having a twofold role in the creation of the market for edible insect products in Europe. On the one hand, it can be a motivation for consumers to consider these novel foods and on the other hand it can also guide the entrepreneur to start a business in this emergent field and to face the challenges related to the introduction of a new, more sustainable alternative. It is interesting that the findings suggest a more one-sided role of sustainability and show a discrepancy between the entrepreneurs' values and their communication.

In line with sustainable entrepreneurship literature (Kuckertz and Wagner 2010, Schick et al. 2002, Spence et al. 2011), awareness of sustainability issues is high in the sample. Their sustainability orientation seems to have led at least five of the six entrepreneurs to start their ventures and consider environmental issues in the implementation of their businesses. Also the characteristics suggested by Patzelt and Shepherd (2011) as having a positive effect on the recognition of sustainable development opportunities can be found in the entrepreneurs of the sample: most of them do business in an environment they know well, they are personally motivated but they also hope to have a positive impact for others by proposing a more sustainable alternative that responds to issues in the global food system.

However, none of the businesses call themselves a sustainable or environmental enterprise or mention a double or triple bottom line and also in the business communication sustainability is not the prime argument but seems to be an additional plus point, interesting for some customers, but not used for the main value proposition in most cases, as already mentioned before. It appears thus that in the presented cases, the role of sustainability lies mainly in being a driver for business creation.

6.4 Two main strategies: low visibility and easy access versus insect prominence for connoisseurs

Looking at the business models of the six case companies, it seems that two major strategies can be identified that are reflected in the value proposition, the selected channels and customer segments.

The companies offering products containing a percentage of insect ingredients in invisible form are hoping to reach the general public by proposing a nutritious and sustainable alternative that is available (or planned to be available) in organic or delicatessen shops and/or supermarkets. This channel allows the companies to expose all clients of the selected stores to their products and increase the convenience of purchasing insect food products as additional efforts to obtain these products are minimised.

For this group, the strategies applied in practice are mostly in line with what entomophagy research suggests for increasing consumer acceptance of insects in Europe: the visibility of the insects in the products is minimal and they are combined with known ingredients that also dominate the taste of the product in order to ease the introduction of insects into the diet (Caparros Megido et al. 2014, Lensvelt and Steenbekkers 2014, Martins and Pliner 2005, Tan et al. 2015). A particularity that is not explicitly mentioned in research but is clearly visible in the sample is that not only a combination with known ingredients increases the acceptance, but the companies try to convince with known products that do not disrupt the eating habits, but allow to simply add the insect ingredient to the usual dish, for example in the form of insect flour in pasta and biscuits or mixed into spreads. This can be seen as a method of adapting insects as a food ingredient to the local food culture.

The other strategy that is pursued mainly by Anty Gin and Snack-Insects but also in part by Micronutris for its whole insect products, is to offer a product where the insect itself and its being special is the prominent and appreciated aspect of the product, rather than its nutritional or environmental qualities that are additional advantages. For this group, the products are not available in a shop, but online mostly through the companies' own online shops and they are targeted at specific customer groups who are willing to take the initiative and order the products online. In the cases of the sample those customer segments are often experienced entomophagists and gastronomy or industry actors. The online channel allows the companies to have a wider reach and to address potential customers who are actively looking for insect products. This latter group of insect food providers relies on the information, education and exposure strategy and the method of increasing the interest in the product to raise consumer acceptance and gain customers, as mentioned in 6.1. The

more limited measures taken to increase consumer acceptance might result in a reduced penetration of this kind of products at least at the initial stages of the introduction of entomophagy in Europe.

Looking at the communication and business model choices from the perspective of Looy and colleagues' (2014) claim that rational, emotional and cultural aspects need to be considered to make entomophagy viable in Europe, it can be said that all of those aspects are taken into consideration to some extent by the companies. While the communication with its emphasis on personal benefits appeals to the rationality of the consumer, the cultural and emotional aspects that are tightly interlinked, are particularly considered by companies offering processed food products where the disgust factor is being reduced through adding insects in unrecognisable form into everyday products that are adapted to the local food culture.

The different value propositions and other business model choices, lines of communication, outreach and networking activities including information, education and exposure to edible insects as well as collaborations with different actors are all aimed at working together in increasing the legitimacy of insects as food by influencing the dominant food culture and opening people's minds towards entomophagy. The entrepreneurs seem aware that changing the eating habits to include edible insects is a process and they are willing to adapt to changing situations and to go incrementally, revising their strategies as acceptance increases.

It is important to remind here, that this research looks at the business side and explores which actions and strategies are taken by businesses in the sector to increase consumer acceptance and legitimacy of their products. In the above, I showed how the specific business actions and choices are in line with suggestions by entomophagy, food choice and market creation research. It is not within the boundaries of this research, however, to evaluate the effectiveness of different strategies that would require an extensive research among consumers.

7. Conclusions

In this final chapter of my thesis, I summarise the main findings of my research and highlight the practical implications of my work. In the last part, I indicate what further research would be necessary to gain deeper insights into the role of businesses in market creation for more sustainable alternatives and the effectiveness of strategies to increase consumer acceptance for insect food products.

7.1 Main findings

Edible insects constitute an alternative protein source with enormous potential to increase the sustainability of the global food system and contribute positively to food security. However, the Western aversion towards edible insects has negative effects on their consumption on a global scale. Introducing entomophagy into the European diet could thus have positive effects worldwide. (Looy et al. 2014, van Huis et al. 2013).

One actor group that is contributing to changing European eating habits and introducing edible insects are businesses offering a variety of insect food products. Given the fact that entomophagy is not yet a widespread practice in Europe, the business environment for insect food products is challenging, with low consumer acceptance and unclear legislation, and consumers as well as other actors need to be convinced of the value and legitimacy of insects as a food source.

So far, the research focus in the field of entomophagy has been on the consumer and possible ways to increase acceptance of insects as food, and the raw material - the insects themselves - in terms of benefits and risks. The present research takes a different perspective and investigates the role of companies that offer insect food products in market creation for entomophagy in Europe by answering the research question: *How do businesses offering edible insect food products contribute to the creation of markets for entomophagy in Europe?*

In this way, it can be understood how entomophagy is made viable by businesses in the sector and which actions and strategies are used for creating the market in Europe and addressing related challenges. The research also allows to present a variety of business model choices that support the market development and to see which strategies suggested in consumer research about entomophagy

are already applied in practice by the businesses. Finally, the role of sustainability in the development of markets for edible insect food products can be determined.

The findings of the research, which are summarised next, can be helpful in understanding the industry, the challenges it is facing and the support needed from different actors to promote the spread of entomophagy in Europe and pave the way for a more prominent role of this sustainable protein source globally.

Businesses play an important role in spreading entomophagy in Europe, by making insect food products available in the first place. In order to cope with the low consumer acceptance and legitimacy of edible insects as a novel food, they engage in a variety of outreach activities such as participation in events, trade fairs, tastings and presence in different media, to spread information about entomophagy and its benefits and give potential consumers a possibility to try insects and processed insect food products. These activities are an integral part of the business operations of the insect food providers.

A further way to shape the market for edible insects is through the choice of product that is being offered by the companies. From the research it can be seen that the businesses offering insect food products address different customer segments with different strategies to increase consumer acceptance. The two main strategies that have been revealed in the sample are the following:

1. Companies offering processed food products that resemble common food products and are adapted to the local food culture but contain unrecognisable insect ingredients. Here the insects are mixed with known and liked ingredients that constitute the dominant taste of the product in most cases. These products are conceived for the general public and are or will be mostly available in organic or delicatessen shops and/or supermarkets.

2. Companies offering products that value and highlight the insect as a food ingredient in visibility and taste, either in form of whole insect products or in an insect infused beverage in the case of Anty Gin. Here the products are communicated as a delicacy, something special, and target a smaller, more specific customer group. The channel chosen for those products are online shops, mainly of the companies themselves, but also online retailers.

While the first group adapts their products to the local food culture and plays on easy availability in the regular organic or delicatessen store and/or supermarket as well as easy preparation to increase convenience, the second group relies on an increased interest for the product due to its distinctiveness.

The communication and choice of arguments in favour of entomophagy vary between the companies and are often adapted to the addressed customer segment. Generally it can be said that the communication of all companies relies on rational appeals and emphasises personal benefits for the consumer. The good taste and the nutritional value are the most prominent arguments used, but also the environmental benefits are mentioned by most companies. Moreover, the case companies emphasise the high quality of their products and mention the importance of know-how and professionalism in insect food production that are used as arguments for legitimation.

While the role of sustainability in building up the market for this novel food might be seen as twofold, sustainability being an aspect that adds value to the products and being a motivation for entrepreneurs at the same time, the research shows that really, it is mainly a driver for business creation and only used as a secondary sales argument, adding to the legitimacy of the products rather than to their value for customers that is mainly brought by personal benefits of the products. The values of the entrepreneurs that in most cases influenced the founding and implementation of the enterprises are not reflected strongly in the company communication of the majority of the sample.

While the research shows that industry associations play a limited role in supporting the sample businesses in the creation of markets for entomophagy, collaboration with a variety of specialised actors that can contribute to a more professional production process, high quality supply and convey trustworthiness, as well as strong interaction with the consumers seem crucial for the success of the industry.

7.2 Practical implications

This thesis has practical implications for a number of actors:

First of all, the findings can be of use for entrepreneurs who want to enter the insect food industry. They give a clearer idea of what to expect and of the aspects that need particular consideration for a successful commercialisation of edible insects. The most important aspects here are the need for a high quality product and professionalism throughout the value chain, as well as the necessity to engage in a variety of outreach activities that legitimate entomophagy in general and allow to create a market for insect food products in Europe.

For this group of actors as well as generally for entrepreneurs and potential future entrepreneurs with a sustainability orientation, this thesis can also be seen as a source of motivation, as the sample

entrepreneurs are examples of people with a motivation to change something to the better and although the edible insect industry represents a challenging environment in terms of consumer acceptance, legislation and simply because it is a new and small industry in Europe, they are succeeding and the change that they are contributing to is already becoming visible.

This research also shows that action by policy makers is urgently required to support and stabilise the industry and lower the uncertainties and the required effort to make insect food available in Europe. The comparatively large number of insect food companies active in Belgium shows that a more stable legal environment can further the industry and encourage entrepreneurs to take advantage of business opportunities that help create a more sustainable food system.

Furthermore, the action and support of retailers is needed to increase the impact and potential of insect food products. They are an important intermediary between the insect food industry and the general public and can greatly contribute to making the food system that they are a part of more sustainable by introducing more sustainable products to their offer.

And finally, for the associations that already exist to support entomophagy in Europe as well as for future national associations, this research shows, that for the support of a young industry, openness towards different values and agendas allows for an inclusion of all actors, and active members who are willing to share information and learn together are essential for a successful industry association that creates value for its members. Given the vast amount of activities entrepreneurs have to engage in when starting a business in the insect food industry, an association that combines actors using insects in different ways and thus including actors with already established businesses, allows to share responsibilities and to advance together rather than creating an additional burden for the new entrepreneurs.

The sample companies involved in this study are highly valued as sources of information and all the insights and conclusions drawn would not have been possible without their collaboration. I am thankful for their willingness to participate, their time and openness and hope that they can derive some benefit and interesting information from reading my interpretation of their business choices and activities, as well as the ones of their comrades in the insect food industry, guided by extant literature in different fields.

7.3 Suggestions for further research

The thesis presents a perspective on the insect food industry and the creation of a market for entomophagy by looking at six sample companies that were willing to participate in the study. The companies show different approaches in terms of value proposition and sales argument, used channel and targeted customer segments that all allow to address the challenges the young industry is facing. The research gives by no means a complete picture of the insect food industry, nor of all the possible strategies for market creation in a new field; nevertheless does it allow to gain some insights into how more sustainable products can be introduced and made appealing for customers, even though they might seem controversial at the beginning. It also needs to be mentioned, that the investigated industry is very young and the presented findings reflect the early stages of the industry development.

In order to gain a deeper understanding of the industry and strategies used for market creation and expansion, further studies could be conducted with a larger sample in Europe, or in the United States, where consumer acceptance of edible insects might be similarly low and insect food companies might face similar challenges in convincing the general public of the value and legitimacy of their products.

The market creation process and the effectiveness of specific actions and strategies could be investigated in a longitudinal study that follows and evaluates the different activities of the companies to gain a clearer understanding of what is really essential and effective in increasing consumer acceptance. A more complete study about market creation could also be conducted in several years, when the insect food industry has grown and different steps are more clearly visible in retrospective.

Further research could support the development of the industry by investigating different association structures and needed activities for fostering the industry development to guide the creation of strong supportive structures for the industry on a national and international level.

Moreover, investigations on market creation for other novel products with a sustainability aspect in or outside the food sector would allow for comparisons, so that similarities and patterns could be highlighted, and successful strategies for market creation for more sustainable alternatives identified that could then allow for a smoother introduction and market creation process for future products.

Finally, the insect food industry seems to lend itself well for research in the field of sustainable entrepreneurship given its strong sustainability aspect, as well as for research in food choice, where particularly the disgust factor of this novel food and strategies to reduce it could be further investigated.

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The company photos in chapter 4 were provided by the companies.