Food cultures, eating insects and the future

BSc Thesis - Anne Schuurmans

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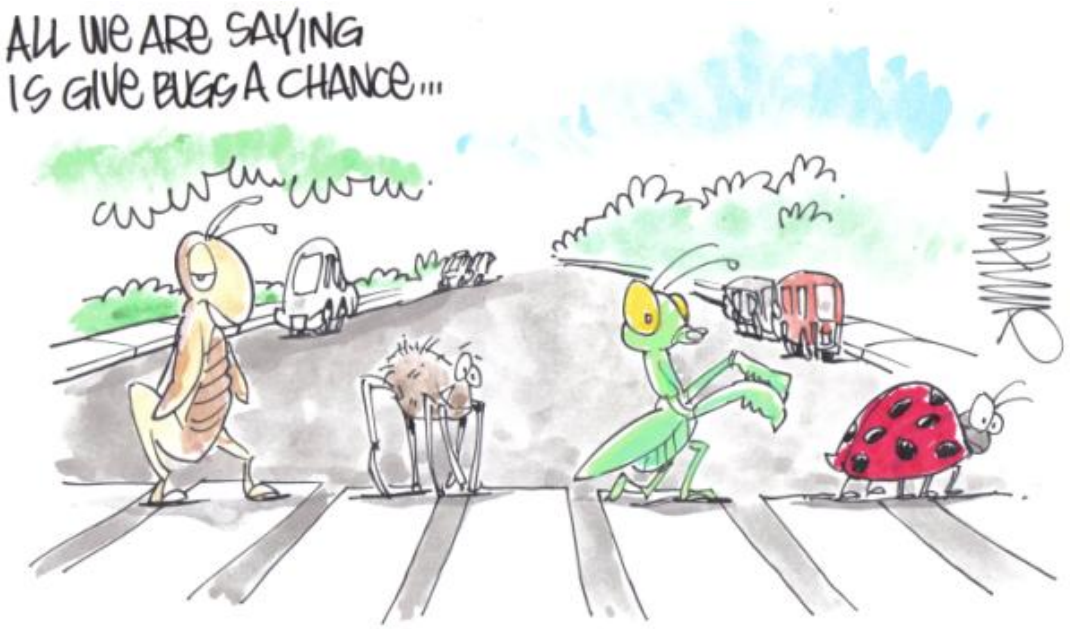

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Executive summary

The main purpose of this report is to find out how insights on the role of entomophagy in different food cultures around the world be used to overcome the barrier in Western food cultures. The motivation behind this topic, was the increasing demand for food and the need for a sustainable alternative source of protein, as the current production of protein puts an extremely high pressure on land and environment. Insects are believed to be a sustainable alternative, but in Western food cultures, insects are viewed with disgust.

First, the reasons for the negative attitude towards insects and entomophagy in the Western food cultures is explored. I find out how the Western food cultures have evolved to their present state. Due to industrialization, feelings of indifference towards insects, have changed into disgust. People have become more distantiated to nature and therefore do not relate to insects. Unless an insect has aesthetic, ecological or practical value, most Western people tend to dislike them more. Also, people associate insects with crop degradation and disease, human diseases and find their alien looks frightening. Entomophagy is not quite a taboo in the West, but it has some taboo aspects. The most important one, is that a taboo defines group identity and cohesion.

Next, the focus shifts to the food cultures where entomophagy is practiced. The focus lies on three areas; Latin America, Africa and Asia. Of food cultures in each region, the role of entomophagy, the contribution of entomophagy to livelihood sustainability and the changing diets are discussed. None of the food cultures are alike, but it is clear that some aspects play a big role. In all three regions, history and tradition play a big role. In any of them, insects are eaten since time immemorial. In food cultures, availability, knowledge, rituals and religion play a big role. Livelihood sustainability and insects also have strong ties, as they influence gender relations, markets and exploitation by businesses, entomophagy is used to protect crops and projects for insect farmers have been set up, that have proven to be effective and beneficial. In all three regions, globalizing Western food cultures are affecting the practice and tradition of entomophagy.

Finally, it is discussed how insects can be introduced in Western food cultures. In this chapter, the concept neophobia (fear for trying new foods) is discussed. This fear is affected by different aspects. It is higher among people who live in rural areas and literature is contradictory on the influence of age on neophobia. Experience and social influence are also proven to influence the level of neophobia. As a result of these findings, two main strategies are presented. When high-end restaurants, celebrities and other admired people start working with or eating insects, people will easily follow. Food is culture and culture is a means to distinguish yourself. Therefore people tend to copy the people with whom they want to identify themselves. The other outcome is that education may help – but only if this education involves experiencing entomophagy. Bug-banquets in which people are first lectured about the positive aspects of

insects and are then offered some edible insects, have been proven to be successful. Also, using insects processed in foods and thus making them unrecognizable can help to lower neophobia.

In this thesis, I hope to be able to shed a light on the way food cultures work and change. Insights on food cultures – complex as they are – might help others to find ways to make them more sustainable.

Contents

1. Introduction

Although the increase of world population growth is stagnating, the world population itself is still growing quickly. In the year 2050, the world population is expected to count a staggering 9 billion people. In order to feed all of them, food production will need to almost double (Van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G. & Vantomme, P., 2013). Oceans are already overfished. Land and clean water are already scarce and the current ways of industry and agricultural production are causing high pressure on our climate and biodiversity. These problems will cause great challenges for the following generations to provide for food in the most sustainable way as possible. Not only the means of production have to change, but also the ways and degree of consumption. To do this, we must assess what we consume, how we consume and how this can possibly be changed to a more sustainable pattern.

Living standards and incomes are rising, especially in Asia and as a consequence, also the demand for meat currently increases. The production of meat takes up a lot of space and also exerts a great deal of greenhouse gases into the atmosphere. To obtain one kilogram of high quality meat, approximately 6 kilogram of plant protein are needed. Livestock production – including transport and feed – accounts for about 18 percent of all greenhouse gas emissions (Van Huis, 2013).

Eating insects is a widespread practice in many countries, all over the world. It has been recorded that over 2 billion people eat insects on a regular basis (Van Huis et al., 2013). The practice of eating insects is also called *entomophagy*. Entomophagy seems like a great alternative for cattle, perhaps not to replace it completely, but at least partially. Insects have a higher conversion rate, which means that they need far less feed in order to produce the same amount of weight as cattle does. The feed conversion rate [FCR], the amount of kilograms needed to produce one kilogram of edible meat differs greatly between cattle and insects. According to Van Huis (2013), the following FCRs were calculated; 2.5 for chicken, 5 for pork, 10 for beef and a staggering average of 1 for house crickets. Insects are easy to farm, they need little space, grow quickly and reproduce easily (Premalatha & Abbasi, Abbasi & Abbasi, 2011). When switching from cattle to insects, the area that used to be cultivated with crops for animal feed – such as maize or soy - can then also be used for crop cultivation to feed people.

The arguments stated above, make insects seem a sustainable and attractive alternative, but introducing entomophagy to Western food cultures will not go without trouble. In many countries, insects are viewed with feelings of disgust and contempt, eating them would not sound appetizing to these citizens (Van Huis et al, 2013; Van Huis, 2013). This is the case in especially Western countries (DeFoliart, 1992; DeFoliart, 1999; Van Huis et al., 2013; Megido et al., 2014) Since Westerners are among the greatest meat-consumers in the world, a dilemma arises (Delgado, 2003). On the one hand, cattle for meat production

exerts a huge pressure on the earth and environment and edible insects seem to be a sustainable alternative for this issue. On the other hand, nearly two-thirds of all animal protein in the world is consumed in developed countries, where insects are considered to be unclean (Delgado, 2003; Van Huis et al., 2013). Of course, protein can also be obtained from, for instance, lentils and beans. However, animal protein is believed to provide in different forms of protein than plants, which are important for especially younger children and older people. In fact, soy is the only plant that resembles meat in its protein composition. However, soy contains an enzyme which causes its proteins to be less absorbable by humans (Fresco, 2012). For this reason, I intend to look more into insects as an alternative protein source from cattle meat. This thesis aims to figure out how edible insects are part of food cultures around the world and how this also can be achieved in Western countries. The main question that I try to answer here is thus: How can insights on the role of entomophagy in different food cultures around the world be used to overcome the barrier in Western food cultures?

By Western food cultures, I mean the aspects of Western food cultures that are strongly associated with globalisation. I refer here to the standardization of agriculture and food processing, the fast food cultures and the loss of traditional 'slow' cooking.

This will be mainly a literature research, with only an occasional reference to personal communication. In order to gather some background information, I started off with reading the FAO report "Edible insects – Future prospects for food and feed security" (Van Huis et al., 2013). This report is the biggest and most complete document that I could find on edible insects. I used this as an inspiration for my research questions; the topics of food culture, disgust, taboo, et cetera are all covered in this report. Whenever I needed more information about the topics that were covered in the report, I looked at the references. Also, the websites "Scopus" and "Web of Science" were very helpful in finding articles. Also, the list of references used in the articles that I found, was very helpful to find the right information. I also had the opportunity to borrow a binder full of articles on the topic from Jessica Duncan. I designed my research questions beforehand, but while reading and writing, I found the cases that I used in my thesis. I came across an article about sushi while I was looking for novel food acceptance on Scopus, for instance.

In order to answer my main question, I will first elaborate on the food cultures in which entomophagy is practiced. I chose for the concept 'food culture' as I will elaborate on all food aspects of culture that relate to entomophagy. Wahlqvist (2007) describes food cultures as arising "*out of the place of a people's origin, whether they still live there or not, but is shaped by resources (climate, land, soil, water, and fuel), by belief and information (religion, education and literacy, communication), by ethnicity (indigenous or immigrant), technology (hunting, gathering, agricultural, horticultural, aquacultural, fishing; food processing and storage, transport, cooking); colonisation; and by health status and health care"* (p. 2). This description not only emphasizes the influence of historical development on food cultures, it also clearly shows how food cultures involve many aspects of daily life. The way people handle these aspects of daily life – such as agriculture and resources – can be seen as a means of

sustaining livelihoods, which by Chambers and Conway (1991) are defined as: "*Livelihood is defined as adequate stocks and flows of food and cash to meet basic needs…Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis"* (p. 5). Sustaining livelihoods is, in other words, safeguarding the quality of daily life of which food is a fundamental part. Therefore, I consider it very important to not only discuss the food cultures, but also the means of livelihood sustainability.

Another important aspect of the dilemma discussed above, is the negative attitude towards insects in Western food cultures. In order to understand a negative attitude, it is crucial to discuss the origins and the nature of it. According to literature, the negative attitude towards insects is mainly caused by a reaction of disgust (Kellert, 1993; Van Huis et al., 2013; DeFoliart, 1999). Rozin and Fallon (1987) define disgust as: "*Revulsion at the prospect of (oral) incorporation of an offensive object. The offensive objects are contaminants; that is, if they even briefly contact an acceptable food, they tend to render that food unacceptable"* (p. 23). Also, disgust is for a great part culturally defined (Haidt, Rozin, McCauley, & Imada, 1997). When disgust falls short to describe the general negative attitude and there is a moral consensus on not ingesting a certain food in food cultures, we may speak of food taboos (Meyer-Rochow, 2009). It is important to make this distinction, because in the case of disgust, there is no or little morality attached to the act of eating the particular food.

The first sub-question is: Why are insects viewed with disgust in Western food cultures? I try to find out how the negative attitude towards insects has come to an existence in Western food cultures. As discussed above, historical development is crucial in how food cultures developed to their contemporary form. Therefore, I will first shortly elaborate on how the Western food cultures have developed to their current state. Furthermore, to answer this sub-question, I will discuss why there is a negative attitude towards insects in Western food cultures. Then I will use insights from literature on the origins and functions of food taboos – in general. These conclusions are then to be used in the final chapter.

The next chapter of this thesis focuses on regions in the world in which insects are a part of the food cultures. The regions where entomophagy is practiced are mainly in Latin America, Africa and Asia (Bodenheimer, 1951; Defoliart, 1999). The question that I attempt to answer in this chapter is: How is entomophagy part of different food cultures? I will do this by discussing the different food cultures and how entomophagy is practiced. I will also consider the livelihood sustainability and the role of entomophagy in this – as livelihood strategies are a great determining factor in food cultures. I will finally discuss if these food cultures are changing. I consider this important, as information on food cultures and the way they change, can provide insights on how food cultures work in general. These insights can be used to develop ideas and strategies to overcome the cultural barrier on eating insects in Western food cultures. I speak of food cultures (in plural) to emphasize the fact that even within the Western styles of eating (and everything concerned with that) there are big differences. There is a French food culture, a Dutch one, a British food culture and so on. Also, within countries, food cultures vary. It is impossible to generalise all food cultures for, say, African countries, and the same counts for the Western countries. I

will compare my findings from this chapter with those from the second chapter in order to explain the differences in food cultures.

The sub-question for the final chapter is: How can insects be introduced in Western food cultures? This chapter will elaborate on the acceptance of novel foods in general and the acceptance of insects as novel food in specific. I will use the findings of the first and second sub-question to back my findings and arguments. Having a general overview on how insects can become an aspect of the food cultures in Western food cultures might provide interesting ideas on future strategies to overcome the cultural barriers so entomophagy can become a sustainable solution for the growing world population.

I will then reflect on my own research, its pitfalls and my questions for debate and suggestions for future research in the discussion. My answer to my research question will be presented in the general conclusion. Finally, I will reflect on my own learning process and experience in the personal reflection. In the appendix, I added some recipes in case those who read this thesis have been convinced of the environmental and health benefits of edible insects and would like to try them themselves!

2. Western food cultures and the attitude towards entomophagy

The reason for the negative attitude towards entomophagy within Western cultures has many aspects and lies deeply rooted. In order to understand these, it is necessary to look at the history of Western food culture and how it evolved to its present state. Axelson (1986) states that culture is not innate; it is learned and passed on to next generations. This would mean that food cultures can be sensitive for changes, which would then provide opportunities to influence the negative Western attitude towards insects.

I will then continue to elaborate on the negative association Westerners have with insects and explain how it came into being. Next, I will discuss the functions and aspects of (food) taboos in culture and reflect on entomophagy in the west. Finally I will shortly discuss if entomophagy is really a food taboo in Western food cultures. I decided to do this, because entomophagy has never been practiced and insects have simply never been seen as food. It must be made clear that the fact that taboos are discussed in this paper does not have mean that entomophagy is a taboo in the West. The information on taboo might however be of any help when trying to tackle the general negative attitude – as a general negative attitude towards an act is the basis for taboo (Meyer-Rochow, 2009).

2.1 A short history of Western food cultures

The area between the rivers Euphrates and Tigris in Western Asia, is also referred to as the 'fertile crescent'. This is the area where, over 7000 years ago, the Mesopotamian civilization came into existence. The start of the Mesopotamian civilization is considered the start of developments towards efficient societies as they are today. The reason for this, is the transition from hunting and gathering towards agriculture; efficiently working the land so that it provides with all sorts of crops that are edible, using animals to support this. The first pieces of evidence were found about 10.000 years ago. The farmers who worked the land and domesticated the cattle, produced more than they needed, so they could feed a bigger group of people. Since there was no need to travel around in order to hunt and gather food, people could stay to live in the same place – people built settlements and this was the start of the development of society towards the way it is today (Fresco, 2012).

The knowledge of agriculture spread out swiftly over Europe - and was later on introduced in the America's - and only a selection of animals and plant species were domesticated for agricultural purposes. They proved to be nutritious crops (for example, cereals such as wheat) or provided in milk, leather and wool, plough traction and manure for the land (for example cows and sheep). As a result, the hunter-gatherer lifestyle faded out and therewith food cultures changed; the consumption of edible insects decreased (Van Huis et al., 2013). Although locusts are recorded to be consumed in the Fertile Crescent, they provided for less meat and by-products than cattle and were only eaten in times of outbreaks (Amar, 2002). In general, undomesticated foods became less and less important and diets increasingly existed of farmed crops and products from cattle. The growing impact of agriculture on people's lives also lead to an

increased fear for a poor harvest due to pests, plagues and bad weather. Insects increasingly were seen as a huge threat for food provision and health and therefore the idea of them would trigger a lot of negative feelings (Van Huis et al., 2013). Also, they were associated with the hunter-gatherer lifestyle and eating them was therefore considered primitive (Vane-Wright, 1991).

For many years, Western societies existed of agricultural communities. As the industrial revolution commenced in England in the eighteenth century, this changed. Agriculture became even more efficient and yields increased even more – which meant that less farmers could produce for more people. The industrial sector grew as a result of this and people moved to urban areas to find a job. All over Europe, urbanisation was a huge trend and even today, it is ongoing (Daniels, Bradshaw, Shaw, & Sidaway, 2008). As more people live in urban areas and rural areas become abandoned, the connection between society and nature becomes looser. People become increasingly distantiated from nature and foods are mass-produced – most of the Western food products can hardly be related to nature (Van Huis et al., 2013). It has to be noted here that insects were never truly a part of Western food cultures, but the negative attitude towards them has increased over time – which increases the challenge to overcome this negative barrier.

One of the consequences is increased disgust towards dead animals – in general, people do not want to have animals on their plate which they can recognise as such. Lobster and shrimps are only a small exception to this rule. When eating a steak of beef or salmon, people do not consider the fact that it was once an animal that lived in a meadow, cowshed or the sea. Weil (2007) distinguishes "zoophagy" – the eating of recognizable animals – from "sarcophagy" – eating flesh that cannot identified with a specific animal. She shows that there has been a gradual shift from zoophagy to sarcophagy in the beginning of the nineteenth century. Western food cultures have become all about efficiency and convenience. Take-away restaurants like McDonalds and Burger King became synonymous for a flourishing capitalist economy and Western lifestyles. Since food is available everywhere – on every street corner or train station – most people do not even consider the fact that there is a long story behind every food product (Fresco, 2012).

2.2 Disgust, insects and entomophagy

There are many reasons as to why insects are not eaten in Western food cultures. One of the main reasons, is that there are not as many insect species available that are edible and big enough to adequately provide in protein (Van Huis et al., 2013). As Mela (1999) states, if foods are not available, they will not be eaten.

However, insects can be farmed and availability may not have to be a problem (Van Huis et al., 2013). But simply farming insects does not mean that they will then automatically become part of the Western food cultures. The biggest reason why entomophagy is not practiced by Western people, is because they do not

only see insects as 'inedible', they look at them with disgust. Most Western people shudder by the idea of insects – let alone by the idea of eating them (DeFoliart, 1992; DeFoliart, 1999; Van Huis et al., 2013; Megido et al., 2014). As mentioned before, this feeling of disgust is, to a great extent, culturally determined (Haidt et al., 1997). Some of the (cultural) causes of this negative association with insects are discussed above, but this phenomenon has much more aspects on which I will elaborate here.

The literal translation of the word dis-gust means "bad taste". Disgust is defined as one of the basic emotions because its experience is universal; as a visceral rejection paired with a distinctive facial expression – closing the nostrils and opening the mouth, shutting out smell and excreting saliva (Rozin and Fallon, 1987; Looy 2004). Seven categories of elicitors of disgust are defined; food, animals, sexual deviance, body-envelope violations, contact with death, poor hygiene and body products – all of them are of a natural origin.

Rozin and Fallon (1987) give several examples of disgust and they consider it to be a mainly food-related emotion. For instance, when a dead, sterilized cockroach is dropped into a glass of milk and then removed, people will not drink the milk. This definition makes it clear that disgust is not only something that has to do with actual 'bad taste' but even more with a complicated notion of 'offensiveness' that expresses itself in the fear of contamination while there might not even be the slightest risk.

Frazer and Mauss (in Rozin & Fallon, 1987) have set up two laws of disgust. The first law is *contagion,* which in short means that "*things which have once been in contact with each other continue ever afterwards to act on each other*" (as cited in Rozin & Fallon, 1987, p. 30). The example of the cockroach in the glass, discussed above, is an example of *contagion*. And no matter how often the glass would be sterilized, the association with the cockroach will remain – and so will the tendency to feel disgusted about the milk. The second law is *similarity*, which means that two objects that resemble each other are assumed to have like properties (Rozin & Fallon, 1987). This explains why many Americans would be reluctant to eat chocolate fudge shaped like dog faeces or drink apple juice from a bedpan (Haidt et al., 1997).

Haidt et al. (1997), like Rozin and Fallon (1987), regard disgust to be a food-related emotion. They state that disgust is not only rooted in evolution, but is also a product of culture; elicitors of feelings of disgust differ strongly among cultures and are learned. Unlike many animals that instinctively know what to eat, humans have to learn what to eat and what not to eat. It is believed that this is the origin of feelings of disgust and food taboos as they might serve as tools for survival; teaching your children what not to eat and reproducing feelings of disgust towards certain products ("that is yuck, don't eat that earthworm!") helps develop a stimulus to refrain of it in future situations and hence avoid diseases or injuries.

Humans are omnivores; their diet consists out of both animals and plants. Being omnivorous has its advantages over being a herbivore or carnivore, as omnivores are more free and flexible to depend on any

food source they prefer. When trying a new food source, omnivores – in this case humans – are in a dilemma because not all foods that seem edible, are actually good to eat. They might be infected or toxic, and tasting it is taking a big risk. This is called the 'omnivore's dilemma', people are having an internal conflict. On the one hand, they want to explore and to try novel foods, which is referred to as neophilia. On the other hand however, these foods are subject to scrutiny and handled with caution, which is referred to as neophobia (Haidt et al., 1997).

In order to understand the feelings of disgust towards insects in particular, several projects were carried out. Research on perceptions of disgust towards invertebrates (which not only include insects, but also other arthropods and molluscs) is performed by Kellert (1993). He issued questionnaires among the inhabitants of the American state Connecticut and he took some special samples, consisting of different groups of citizens, farmers, scientists and nature conservation organisation members. It appeared that the general public – the citizens - exposed an overall negative attitude toward invertebrates and averted feelings toward the idea of having insects inside their home. Notably, the farmers had a similar attitude towards invertebrates. The group of nature conservation organisation members slightly appreciated the invertebrates more and the scientists showed a far more appreciative attitude than all other research participants.

In general, it showed that attitudes toward invertebrates were more positive when they either had a nice appearance (like butterflies and ladybugs) or a practical value for people (like shrimps) or played a substantial role in the ecology (like honeybees). This would also be part of the explanation for the appreciation for insects in the regions in Latin America, Africa and Asia that are discussed in Chapter 3. In these regions, many insect species play a substantial role for sustaining peoples' livelihoods and provide in nutrition and income – they are of a great practical value. Because in Western countries, insects are not eaten, their practical value for people is much lower and this may partly explain why Western attitudes are less positive.

Several factors are believed to contribute to the general feelings of aversion and contempt for most invertebrates and especially for arthropods such as insects and spiders. As Öhman (1986) puts it, this is partly due to the fact that humans have the possibility to develop a fear for any animal that frightens them: *"Animal fear originates in a predatory defence system whose function is to allow animals to avoid and escape predators…It is appropriate to speak about biologically prepared learning…likely to require only minimal input…to result in very persistent responses that are not easily extinguished"* (Öhman as cited in Kellert, 1993, p. 852). In other words, it is a part of human nature to be easily scared of an animal that could be a threat. Once people have been scared, this association will not easily go away. This, however, does not justify the great cultural differences in attitudes towards insects and other invertebrates (see chapter 3).

Another aspect of the feelings of hostility towards invertebrates, is that the idea of a connection between invertebrates and human disease is widespread. Westerners – especially those in urban areas - generally are very keen on hygiene and prefer their houses and environment to be very clean as a result of fear for disease – the role of invertebrates in human diseases and epidemics is even a specialty in human medicine. Fear for human diseases from invertebrates is understandable as some of them may be quite harmful – like Lyme's disease spread by ticks. Not all insects are harmful however, only a selection of invertebrates is truly responsible for human diseases (Kellert, 1993). It is notable that entomophagy is mainly practiced in remote and rural areas (see Chapter 3).

Furthermore, as mentioned before, another reason for the negative association with invertebrates, is the fact that they are often responsible for crop degradation, crop diseases and other types of crop damage. Although that only a very small share of all invertebrates is responsible, general knowledge on this is lacking. Many people presume that all invertebrates are harmful, only because some of them are (Kellert, 1993).

People often relate to animals that are more like them, animals that they keep as pets, for instance. Even in some circumstances, these pets are seen as fellow humans and for that reason people often cringe by the idea of eating for example, horse meat. The relation of humans and animals has become complex, however. Although the idea of cows and sheep in the meadow is appreciated, this view is not directly related to the consumption of meat. Industrial animals are turned into "*de-animalized matter*" and we have "*no need to identify the steak on our plate with the steer from which it came*" (Weil, 2007, p. 46). As discussed before, most products that are consumed within the Western food culture, can hardly be related to nature ("sarcophagy"). When considering this in relation to entomophagy, it is understandable why people in the Western world would shrivel by the idea of entomophagy; even when prepared, insects are easily to distinguish as they are eaten as a whole (Kellert, 1993). In this case flour made of ground insects, might provide an alternative.

Also, the fact that invertebrates reside in very big numbers, is considered an explanation for the negative attitude towards them. *"The idea, for example, of a beehive including 50,000 organisms, or an ant colony consisting of a half million ants, or an acre of soil containing 65 million insects, or the beetle order numbering more than one million species, may represent a fundamental challenge to human assumptions of personal identity and individuality"* (Kellert, 1993, p. 852). Human beings cherish the idea of being individuals and living independently and it is difficult to relate to the insects that live so close together in such big numbers. Also the idea that insects account for four-fifths of the animal kingdom and invertebrates constitute 95 percent of all animals, makes individual humans feel small and insignificant (Ramos Elorduy, 1997; Kellert, 1993). This 'fear' of great numbers does not affect the communities discussed in Chapter 3. Kellert (1993) carried out his research with American respondents, this might explain the difference. The food cultures discussed in Chapter 3 are

part of more communal societies, that are based upon strong family and community ties – in contrast to the highly individualistic Western societies. This will be further discussed in the next chapter.

Finally, Hillman (in Kellert, 1993) proposes that the fear of insects and other invertebrates, is mostly caused by the fact that most people know only very little about them. "*While such other-worldliness can provoke curiosity and even wonder in some people, the more typical human response to the unknown is that of fear and disdain. For most people, invertebrates remain largely alien and unfathomable"* (p. 852). It can be contested whether this is a plausible explanation for the disgust towards invertebrates in Western countries; there is so much that many people know very little about.. but not always these things elicit reactions of disgust.

2.3 Food cultures and taboo

Over time, ideas about what is disgusting and what isn't, have become rooted in society and have become are much more than just an evolutionary tool for survival. In most cultures, there are strict, unwritten rules on what is edible and what is inedible – the latter accounting for many food taboos in society (Looy, 2004). Food taboos characterize food cultures. An example of food taboo within Europe is *hippophagy* - the eating of horse meat. It is popular in France, but in many other Western food cultures, the idea of hippophagy is disapproved and regarded with disdain (Weil, 2007).

But what is a taboo exactly? The history of the word itself dates back to the end of the eighteenth century and was introduced in the English language by Captain James Cook. He was on one of his travels on a Polynesian island and noticed a custom among the natives, called 'taboo'. The word meant that something profane or sacred was forbidden for common people to touch. In the case someone broke the 'taboo', they were severely punished; in some cases even death penalty was committed. For a long time, it was considered that 'taboo' was savage and a characteristic of a primitive society. It was not until the 20th century that the concept 'taboo' gained popularity in social studies through the work of Sigmund Freud. Onishi (1999) quotes Freud, who stated that the phenomenon 'taboo' was not simply an aspect of Polynesian culture – it is present in all cultures:

"*It may begin to dawn on us that the taboos of the savage Polynesians are after all not so remote from us as we were inclined to think at first, that the moral and conventional prohibitions by which we ourselves are governed may have some essential relationship with these primitive taboos and that an explanation of taboo might throw a light upon the obscure origin of our own 'categorical imperative'"* (p38.)

It is true that there are various unwritten, inexplicit rules about what is prohibited – these rules need no explanation as everyone in the community feels obliged to obey. It has to be mentioned, that due to

Freud's influence, the meaning of 'taboo' has changed. The focus of the concept has shifted from sacred and profane objects, to the aspect of prohibition itself.

The religious aspect is not the main character of the concept anymore. An example – of which can be said is universal – is the taboo on incest, which is not directly religious. An example of a taboo that was culture bound, was to let jazz musicians perform in prestigious concert halls in 20th century USA. These concert halls were originally assigned for traditional classical music, and to let people make 'black' music in them was completely unheard of in those times. However, taboos are not always unbreakable. In 1924, in the Aeolian Hall in New York, the American composer George Gershwin premiered his famous piece "Rhapsody in Blue", a classical music piece, heavily influenced by jazz music. This concert lead to the acceptance of the use of instruments such as the saxophones in concert halls and classical music. A taboo was broken. Also, as of this premiere, jazz slowly became more characterizing for 'American culture', instead of 'black culture' (Onishi, 1999). This shows that taboos are not static; they are learned but can also be unlearned.

2.4 The functions and origins of food taboos

Meyer-Rochow (2009) performed research on food taboos and listed several aspects of food taboos. One of them are food taboos that are meant to distinguish certain members of society from each other or to highlight special events. For example, restricting some foods to men only may simply be an expression of male dominance. The same goes for the different food taboos for the Indian castes; the highest castes do not eat any fish, eggs and meat, unlike the other castes (Meyer-Rochow, 2009). Also, food taboos surrounding special events, may contribute to the specialty of them. For instance for Jewish people, the Yom Kippur is a religious day of mourning and eating during this day is absolute taboo. This is the only day that Jewish people are not allowed to eat anything and this gives the mourning more meaning (Meyer-Rochow, 2009).

Since (food) taboos and religion are very closely related, I will elaborate on a case study about the Jewish and Hindu food cultures. Religious taboos are not very prominent in contemporary Western culture, but they are nonetheless important in many other cultures. For that reason, I find it important to discuss them anyway. Jews adhere to the Kashrut, a list of dietary laws. On the holy day of Yom Kippur, Jews will fast for twenty four hours in order to show gratitude and for penance. Since it is the holiest day of the Jewish religion, eating on this day is absolute taboo. During the first nine days of 'Av' (a month in the Jewish calendar), no meat is eaten as a sign of respect towards the victims of violence towards Jews in the past (Meyer-Rochow, 2009). On Pessah the 'Exodus' of the Jewish slaves in Egypt is remembered and celebrated and during this holiday, no bread is eaten – except for Matze. Throughout the year, milk or milk-products such as cheese and buttermilk are never consumed together with meat. For meat, there are several rules and taboos. According to Kashrut, a Jew may only eat kosher – clean – foods. Kosher

animals have a cloven hoof and be a ruminant. This means that pigs and horses are not kosher to eat, but cows and sheep are. Aquatic animals have to have fins and scales, so fish are kosher but shellfish and lobsters are not. Creatures that live in and on the ground, reptiles and worms found in fruit or vegetables are prohibited for consumption. To consume blood is absolutely forbidden and for animals to be kosher, they have to be slaughtered according to the Jewish laws, also called "Shohet" (Meyer-Rochow, 2009). An animal that has died from old age or disease, is considered unfit for consumption. Animals that are meant for shohet, must have had a good life and be calm at the moment of slaughter. It must not have the impression that it is going to be slaughtered. During shohet, the throat must be slit with a very sharp knife, so the trachea and the carotid are cut in one go; this will make sure the animal has the least amount of pain possible and will die quickly. It is of great importance that the blood gets out of the body as ingesting blood of any sorts is a taboo for Jews. Dietary laws are not always clear, however, and they leave some room for interpretation. When it comes to the consumption of insects, there is still a lot of discussion going. Some Jews consider it to be kosher and others do not, but it is proven that ancient Israelites ate them (Amar, 2003). Since it is not a 'rule' not to eat insects, entomophagy cannot be considered a taboo for the Jewish (Meyer-Rochow, 2009).

Another aspect of food taboos, according to Meyer-Rochow (2009) is to protect the human health and safety. When a taboo is considered to be assigned by God, or as a command from a "supreme" power, they play a role in the cultural and religious system and can barely be questioned. But there are taboos that evolved out of commonly occurring allergies, for instance. Also, the taboo for Hindus to go outside after sunset to pick fruits does not come out of nowhere. At time the taboo originated, people had no lights to take with them outside and it would be simply too dangerous for them. It is also considered a taboo for pregnant Hindu women to eat jackfruit or papaya, because they are believed to contain substances that elicit natural abortion. Also vomiting, diarrhoea and cramps and even death, were often considered to be an effect of taking in certain foods, which then led to the tabooing of ingesting them. So is alcohol for children taboo in most food cultures as it can harm their development. Also, pig meat is subject to many taboos in most cultures as it often carried parasites that could cause sickness (Meyer-Rochow, 2009). Also, ecological necessity to protect certain resources can be the origin of a food taboo (Meyer-Rochow, 2009). Not seldom, food taboos have an ecologic background. In order to maintain a healthy environment, some foods are prohibited to harvest or to eat (see also chapter 3).

In China, there used to be a taboo on the consumption of cow meat but nowadays, it is not significant anymore and great quantities of cow meat are imported from the USA and Australia. China is known as one of the economically fastest growing nations in the world and its growing middle class. Especially, the middle class desires cow meat, as it is not only considered to taste good but also to be a status symbol. This exponential growth is something that occurs since the last couple of decades. Before that, the Chinese were a lot poorer and lived primarily on vegetables and rice. When they ate animal protein, it was often from cattle that was killed in an accident or insects, snakes, rats, frogs, bats and dogs – eating the

cow that ploughed the land was considered irrational. Also, the population was already high and raising cattle for beef was costly. A quick calculation; if one acre of land can raise ten cows for beef, it will produce 100,000 calories a year; cattle needs time to grow and mature. One acre of rice, on the other hand, will produce 1,000,000 calories a year – as it can be harvested twice a year. In a very densely populated area, where everyone needs to be fed, the best way would be to choose to grow rice. Raising cattle for yourself and letting the community go hungry was considered to be more than just selfish – it was immoral. It can be concluded that food constraint caused the taboo of eating beef. It cannot be said that the taboo had literally to be 'broken', but due to food abundance and economic wealth, people could simply permit to buy beef and eat it – the taboo lost its meaning and simply fell apart (Lai, 2000).

Food taboos can also come into being as an expression of empathy towards the animal; for instance in Western countries, there is a food taboo on pet animals. While guinea pigs are considered a cute pet for children in Western countries, Peruvians are content to have them for dinner. The same counts for cats and dogs, that are loved family members in Western countries, but also considered a good source of meat in some parts of China. In Western countries, pets are increasingly considered to be like fellow humans. Eating them, would be considered a form of 'cannibalism' (Fresco, 2012). Apart from some tribes in Papua-New Guinea, eating human flesh is considered a taboo almost everywhere (Meyer-Rochow, 2009). Another famous example of this type of taboo, is the eating of cow meat in India. The cow is considered holy in India, as it is considered to be the mother of life. There is no bigger sin for a Hindu than to kill a cow. The reason behind this is that cows give milk and provide traction; it is said that, if it would not be for the cows, the Hindu religion would never have been able to spread (Harris, 1989).

It has been discussed earlier in this paper and also Meyer-Rochow states that food taboos are a factor in group cohesion and group identity. *"…it ought to be mentioned that any food taboo, acknowledged by a particular group of people as part of its ways, aids in the cohesion of this group, helps that group stand out amongst others, assist that group to maintain its identity and creates a feeling of "belonging". Thus, food taboos can strengthen the confidence of a group by functioning as a demonstration of the uniqueness of the group in the face of others"* (Meyer-Rochow, 2009 p. 9).
Food culture and taboos can change, but they often stay the same for a very long time and serve to identify populations. For instance, some suggest that some of the food taboos and aspects of food cultures do not necessarily only reflect needs for nutrition, but also show what the lives of their ancestors were like and their needs and concerns (Meyer-Rochow, 2009).

2.5 Conclusion

In this chapter I tried to uncover the reason as to why Westerners generally view insects with feelings of disgust. In order to know what the Western food culture is like, it is important to know how it developed to its present form. As agriculture developed and spread over the European and subsequently, the American continent, some animals and crops were domesticated. The more efficient way of providing in

food made sure that people did not have to keep moving, like the ancient hunters and gatherers did. Settlements and civilisations were built. Through the industrial revolution, even less people had to work as farmers in order to provide for food and many left off to the cities to work in the industrial sector. Through the process of urbanisation and the industrialisation of food production, the connection between society and nature became looser. Food in Western countries has become an industrial product, that is supposed to need little or no preparation. Most people feel so distantiated from nature that, however they enjoy their steak, they cannot bear the idea that it was once a living animal.

Distance from nature can also be seen in the negative attitude towards insects; they are often described as creepy crawlies, with wings and big round facetted eyes. In general, Western people regard insects and other invertebrates with disdain and contempt. However elicitors of disgust differ among cultures, they are all of a natural origin. Two theories of disgust are defined by Frazer and Mauss; *contagion* and *similarity*. People feel disgust if anything either has been in contact with, or looks like an offensive object. Food taboos are a culture related phenomenon. This is because humans are omnivores, who have to learn what is edible and what is not - which is passed on from generation to generation. When trying novel foods, humans are subject to neophilia and neophobia, which is referred to as the omnivore's dilemma.

Kellert (1993) has done extensive research to why Western people are in general offended by the idea of invertebrates – of which insects are part. He states that there is a general feeling of disgust, unless the invertebrate has certain positive aesthetic, practical or ecological values. He also notes that people are easily offended by invertebrates, or other possible threats, and these associations will remain. However this does sound plausible, it does not explain the general cultural differences between cultures in which insects are eaten and cultures in which they are seen as a danger. He also remarks that the negative attitude is also due to the association between invertebrates and human disease. This is the case because Western people prefer their homes to be very sterile as result from the loosening connection with nature. Only a selection of invertebrates is truly dangerous for human health, however.

Also, invertebrates appear to be associated with crop degradation. This is not remarkable, as several invertebrates have been responsible for harvest fails all over the world. However, only a small selection of all invertebrates actually forms a threat for agricultural crops. Another reason as to why many people dislike the idea and sight of invertebrates, is because they look in no way related to humans. They are morphologically and behaviourally so alien, that it is difficult for people to feel a connection with them. Also, the idea of eating them, would be very difficult for Western people. Not only can they not relate to these animals, the idea of eating something that is recognisable, elicits horrible feelings for most people as that has evolved its way out of our food culture. Kellert also mentions that people dislike invertebrates, because they feel intimidated by the fact they reside in big numbers. Finally, Kellert says, people fear invertebrates, because they have little knowledge about them.

Over time, ideas about what is disgusting, become rooted in society and become are much more than just an evolutionary tool for survival. Unwritten rules about prohibited actions, that are culturally defined, are which we call taboos. Meyer-Rochow listed the aspects and functions of food taboos. First of all, a taboo may serve to distinguish certain society members from others and emphasize certain events. It may serve to protect human health and safety or function to safeguard ecological resources. Also, there are food taboos that come forth out of empathy towards the animal. Finally, Meyer-Rochow notes that food taboos tighten group cohesion and define the group's identity. Adhering to a certain set of rules can make you part of a group, ignoring them, can make you an outcast.

3. Entomophagy in food cultures

In this chapter, the role of entomophagy in different food cultures will be discussed. The chapter is divided into three sections; on Latin American, African and Asian food cultures. The role of insects in the food cultures in these regions will be discussed. Subsequently, for each continent I will elaborate on how entomophagy contributes to the livelihoods of the people – which is an important aspect of food cultures. Finally I will discuss if these food cultures are changing and if yes; how and why this is happening.

I chose to sort the chapter by geographical regions, as I deliberately wanted to keep these regions divided from each other. Cultures cannot be generalized, as the differences between food cultures define the identity of the people (Barrena & Sánchez, 2013). This is what I will illustrate by using examples from different food cultures within the regions. Then, the information on the food cultures, what shapes them and whatever may cause them to change, can be used in order to answer the main question of this thesis.

3.1 Latin America

The Latin American food culture has a rich history of eating insects which dates back centuries. Bernardino de Sahugan (1557) describes in his work '*Historia de las cosas de Nueva España'* how eggs of waterbugs were considered delicacies. At the court of ancient Aztec kings in the former Aztec empire, these so-called ahuahutle were prepared during ritual ceremonies to honour the god Xiuhtecutli. The common name for these eggs used was aguaucle which can be translated into "seeds of the water". The Spanish conquistadores referred to them as Mexican caviar. Sahugan also reported that these eggs were sold in Texcoco and neighbouring villages (see Bachstez & Aragon, 1945).
The Aztec empire was densely populated, it managed to grow even without domesticating large animals for protein supply. It is believed that the prime source of protein were insects and insect eggs, the latter being semi-cultivated in ponds in central Mexico (Parsons, 2010). Nowadays, this insect caviar is still being eaten and is referred to as *escamoles* (Ramos Elorduy, 1997).
Not only Mexican food culture is known for entomophagy throughout the ages. In Quito, Ecuador, there are archaeological records where edible beetles and larvae of butterflies and moths are presented as food. Also, reports from the early colonization period prove that insects were a part of the food culture in Ecuador (Onore, 1997).

3.1a Entomophagy in Latin American food culture

Still today, the Latin American food culture is rich in insects. Most insects are only seasonally available and insects are believed to be in harmony with plant life cycles and rainy seasons. For instance in Mexican food culture, locusts – known as chapulines - are being harvested and eaten during the rainy season (Van Huis et al., 2013). Particularly these chapulines are very well known and frequently consumed in the

country for centuries. Especially the Oaxaca state food culture is famous for these grasshoppers and they are popular in many different social classes; among indigenous groups as well as the urban working population (Cohen, Sánchez, & Montiel-Ishino, 2009). The chapulines are often toasted or processed into a chili and served in a tortilla (Cohen *et al.,* 2009; Ramos Elorduy, 2009). Especially in urban areas, they are a popular street food; they are being sold in many street stands and small restaurants and are increasingly found on the menus of expensive restaurants (Ramos Elorduy, 2009). The general idea of eating insects in Mexican food culture seems to be changing. More people seem to regard insects as a more distinguished food, as they are willing to pay more for them in expensive restaurants (Ramos Elorduy, 2009).

Red and white maguey caterpillars are also quite popular in Mexican food culture and many people consider them to be a delicacy. They are found on the *Agave salmiana*, a common succulent plant that mainly grows in central Mexico. The caterpillars are generally deep fried and served in a tortilla with spicy sauce, but they are also to be found in bottles of mezcal liquor, made of the agave plant. These caterpillars are so valuable and high in demand that during the rainy season, agave plantations (for mezcal production) have to be guarded by security agents to stop poaching (Van Huis et al., 2013). Other insects that are high in demand for consumption in the Mexican food culture are the stink bug, mealworms, stingless bees and ant larvae (Ramos Elorduy, 1997)

In many Latin American countries, Western food cultures affect the local food cultures (see paragraph 2.1c) and insects are only still consumed in tribes and other remote rural communities (Onishi, 1999). In the Amazon region, entomophagy is still a substantial part of the food cultures of most tribes. It is recorded that Maku Indians in the tropical forest in Brazil have grubs, caterpillars and termite soldiers in their diet (Milton, 1984). In the Amazonian rainforests in Colombia, the Nukak community eats beetle larvae in the rainy season (Van Huis et al., 2013).

Also, rural communities in remote areas in Ecuador are reported to have insects included in their food culture. One of the most popular edible insects is the order of the *coleoptera*, otherwise known as beetles. Around the beginning of November, the white beetles 'catsos bianco' (*Leucopelaea albescens)* are found in big numbers around Quito, the Ecuadorian capital city. When the beetles are collected, the scales and legs are removed. They are then fried in pork fat with a local onion variety, salt and 'mote'; a local dish with maize.

In the bushy areas in the High Andes ('paramo' in local terms) of the Antizana, the green beetle 'catso verde' (*Pelidnota nigricauda)* is found. It is closely related to the white beetle that is found in the Quito region. The people that live in this region use a lot of different beetle species, but none of them are considered to taste quite as good as the 'catso verde'. A traditional food of this region is fried balls of mixed beetles and is eaten to add variety to the diet; chicken is the main source of protein.

The best known beetle used as food is the palm weevil, which by native Ecuadorians is known locally as 'mayón', 'gualpa' or 'chontacuro'. The Shuaras, a tribe that lives in the central-east of the Amazon forest in Ecuador eat them alive as an appetizer. In the Saraguro area, in the south of Ecuador, the beetle larvae are fried and used as a medicine or food (Onore, 1997).

Throughout Ecuador, bees, wasps and ants are part of the food culture. Especially honey bees are commonly consumed, although the nutritious larvae aren't eaten on a big scale. The native community in San Lorenzo, however, eats them since a couple of decades. At the end of the seventies, there was a big plague of killer bees. This community learned quickly how to harvest the honey and honey combs in its entirety; full of larvae and pupae. Only since then, they have become a part of the local food culture in San Lorenzo. Throughout the country, there are at least a hundred species of stingless bees which are appreciated for their honey. During the harvesting of the honey, the native Ecuadorians often eat the larvae, mixed with honey and pollen. This is a popular treat among children in the inter-Andean valley. They search for nests of the leafcutting bee and eat their contents (Onore, 1997).

Also wasps are quite popular, the larvae and pupae especially. The Shuaras prefer to eat them roasted. Unfortunately is not much information available about the traditional dishes with wasps. Its taste is considered very good, though. Ecuadorians strongly believe that the consumption of wasps can lead to hearing impairment (Onore, 1997). According to Onore (1997), this can be related to the nutrition of the wasps, since some periods of the year it visits flowers that are toxic for people.

In Colombia, the leafcutter ants are seen as a delicacy. They are known as hormigas culonas – which literally translates into 'bigbottomed ants' and their gastronomic and economic value is comparable to that of caviar and truffle mushrooms. Only the ants with wings are eaten and can only be harvested in a three-month period once a year. During this period, a Colombian farmer can earn the amount of a year of day wages (Onore, 1997). Not only are the ants eaten locally, they are transported to Japan, where they also are considered to be a treat.

3.1b Entomophagy and livelihood sustainability in Latin America

In Mexico, households gather insects primarily for their own consumption (Ramos Elorduy, 1997). Gender appears to play a profound role in searching, preparing and selling edible insects on local level. When the insects are easily accessible, they are often harvested by women and children. When the insects are poisonous or when they live in risky environments, they are usually caught by men. Also, the insects caught by the women and children, are usually for self-consumption, whereas the insects caught by men usually end up on commercial markets. The women go to the markets to sell the harvest (Van Huis et al., 2013).

Several species have become so highly demanded that they are sold on local rural markets as well as in big cities and rural harvesters travel far to sell them. In more urban areas, for some insects the prices are very high; $200 per kilogram of escamoles; $250 per kg for the white agave worm and $25 per kg for grasshoppers. In urban areas, cattle fillet costs about $14 per kg on average, so insects are higher in price (Ramos Elorduy, 1997). In small rural markets, the prices are a lot lower; in rural Oaxaca, chapulines cost about $12 a kg (Van Huis et al., 2013).

Insects are also sold on the international market as gourmet items for very high prices. There are very big differences in prices paid to the Mexican insect collector, the middlemen in Mexico and the middlemen of the international companies. Not seldom, middlemen exploit the local insect collectors, who need their incomes to pay for primary needs such as clothes and schooling expenses for their children (Van Huis et al., 2013). The local Mexican insect collectors get paid about $30 for 1 kg of escamoles – which the middleman sells for an average of $180 per kg on the international market.

The same goes for other insect species such as the agave worms and stink bugs (Ramos Elorduy, 1997). The pressure that is put upon insects collectors leads to overexploitation of nature. In Mexico, about 30 insect species are collected for food purposes and 14 of them are now under threat due to overexploitation as a result of commoditization (Schabel, 2010).

Van Huis et al. (2013) suggest that an insect producer and farmer association should be set up in order to address the exploitation of local indigenous Mexican insect collectors and to stimulate the development of new and existing markets of edible insect products.

Another edible insect that is produced and processed on a great scale in Latin America and consumed all over the world is the *Dactylopius coccu*s. From this insect, known as cochineal, a red dye called carmine is obtained for the textile, pharmaceutical and especially the food industry. These lice live on the cactus *Opuntia ficus-indica*, which is cultivated for its pear-like fruits. The largest producers of cochineal are Bolivia, Ecuador and Chile and most of all, Peru. Between the years of 2000 and 2006, the world demand for natural dyes in the food industry plummeted and the total production of cochineal increased more than 2.5 times. This occurred because aversion towards synthetic food dyes was growing and so did the need for more natural food dyes. Cochineal is used in products that are also popular in Western food cultures such as Campari and Danone strawberry yoghurt. In 2006, the total Peruvian production accounted for an export value of US $39.6 million (Van Huis et al., 2013).

The production of cochineal not only contributes to the economy of several Latin American countries, it also provides social and ecological benefits for their citizens. The business creates a lot of employment for poor people, especially in Peru. Also, the production of the *Opuntia ficus-indica* significantly clears the air

from carbon, protects fallow lands from erosion and provides a fertile soil for farming (Van Huis et al., 2013).

3.1c Changing food cultures in Latin America

However entomophagy is still a part of contemporary food cultures in many parts of Latin America - especially in Mexico - the influence of Western eating habits on food cultures are significant. This process has been ongoing since the Spanish conquest; the conquerors did not approve of the indigenous people to eat their traditional dishes – mainly for religious reasons. Eating insects was seen as savage and primitive and the conquerors tried to abolish this. They did not fully succeed, but the role of entomophagy in the local cultures has severely declined in many places in Latin America (Ramos Elorduy, 1997). According to Ramos Elorduy (1997), this was the start of the deterioration of the diets of many people and this development is ever continuing. The popularity and influence of Western lifestyles and foods are growing in Latin America. She reports that in Mexico, in even the most distant places, where people live without electricity or water supply, commercial products such as Coca-Cola can be found. She expresses her worry about further deterioration of diet quality as more healthy products such as fruits are replaced by sweet Western commercial food products such as fast foods, soft drinks and cakes. She refers to this phenomenon as the "colonization" of food products.

Also, she says, national migration plays an important role in food culture. Many people move from rural areas to the city, looking for a better life. These people accustom to the more "Western" eating habits in the city and become detached from their earlier lifestyle, which was more in touch with nature. The people who still live in these rural areas might also be influenced by this so-called colonization of food products, but are also still attached to their roots and traditional way of living (Ramos Elorduy, 1997).

It is not clear how the food cultures in Latin America are currently developing, as there is too little reliable information about it. It does seem however, that the consumption of insects is steadily declining as influences of Western food cultures are increasing (Van Huis et al., 2013; Yen, 2009). This phenomenon might have serious effects on the health of the Latin American people. However unfortunately, information on it is lacking, research on the topic would be recommended.

3.2 Africa

The ancestors of modern humans are believed to have lived in Africa before spreading out and habituating other continents. Johnson (2010) states that it is very likely that insects were a major part of their diets, since primates nowadays seem to find insects delicious. Throughout the continent, many edible insects can still be found. In times when harvests fail or when hunting and fishing are problematic, insects are an important factor in sustaining food security for the African people (Van Huis et al., 2013).

3.2a Entomophagy in African food culture

Not only our ancient ancestors seemed to enjoy eating insects; up to today they are abundantly consumed in African food cultures. According to Van Huis et al. (2013), 30 percent of all edible insects in Africa are caterpillars and they make up 40 percent of the total animal protein consumption. Especially the mopane caterpillar is one of the most popular edible insect species in Africa. It is widely consumed in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia and Zimbabwe. They are high in economic value; the annual harvest of an estimated 9.5 billion caterpillars in Southern Africa is worth about $85 million (Van Huis et al., 2013). Mopane caterpillars are not simply 'famine foods' that are only eaten during periods of food shortage; they are a very useful source of nutrition in poor times, but are also a part of the daily diet (Van Huis et al., 2013). These caterpillars are so nutritious and valuable that many people travel very far in order to harvest the insects – in some cases even hundreds of kilometers. (Kozanayi & Frost, 2002).

In order to prepare the mopane caterpillar, they need to be degutted first. In Botswana, where the mopane caterpillars are consumed on great scale, this is done by firmly squeezing the caterpillars from the head to the anal region. People prefer to roast them in hot ash, but they are also eaten fried, boiled and dried or steamed (Obopile & Seeletso, 2013).

Mbata, Chidumayo and Lwatula (2002) did extensive research on the exploitation and consumption of caterpillars in northern Zambia. They interviewed many community members of the Bisa people in the Mpika district. This is a small, rural community that is mainly dependent on their own crop production and the collection of edible insects. According to 98 percent of the respondents, the practice of collecting caterpillars is a part of the Bisa food culture since time immemorial and so are their rituals and customs related to it. Over time, these people developed a process to prepare the caterpillars in such a way that they are able to last for months. First, the caterpillars are degutted while still alive. Then, they are roasted, like in Botswana, also in hot ashes until they become hardened. Finally, the roasted caterpillars are left in the sun to dry and become crispy.

The caterpillar plays a very big role in the Bisa food culture; during every separate stage, rituals are performed. Monitors are appointed to look after the woodlands and check how the caterpillars are growing. The caterpillars' lives are defined by four stages; egg, larvae, pupae and adult. Every time a new stage has been reached, the community Senior Chief visits a shrine and performs a ceremony. During the ceremony, he offers either a present or caterpillars to the ancestral spirits, to please them, thank them and to ask them for a good caterpillar season and protection for the woodlands and Bisa community. Usually, the harvesting period will start around the beginning of November, a start signal will be given to the community members by the Senior Chief of the Bisa people. The harvesting period lasts about four weeks, until the stop sign is given. Harvesting outside the season is considered to be an absolute taboo. As found in the second chapter, taboos surrounding food, may have an ecological background (Meyer-Rochow, 2009). This taboo in fact originated through the need to restrain the damage done on the caterpillar population (Mbata et al., 2002). Thus, the population will remain constant and next year, the people will still have nutritious caterpillars to eat (see Chapter 2). Also, it is believed by the Bisa people that offenders will get lost in the bush or be bitten by snakes, as a punishment (Mbata et al., 2002).

The caterpillars are an important aspect of many African food cultures and there are many customs, beliefs and traditions related to it. They are not the only edible insect, though, and termites are highly popular as well. Queen termites, however, are only consumed on very special occasions. They are quite rare and valuable, as every termite colony has only one queen. Digging and looking for the queen in the colony is a difficult and time-consuming task and it leads to the death of the entire colony. The queens are extremely nutritious and are fed to undernourished children in Zambia and Uganda. The soldier termites are easier to harvest. This is done in small quantities so it causes less stress on the entire colony. The soldiers are known to be eaten in the Central African Republic, Zimbabwe and the Democratic Republic of Congo (Van Huis et al., 2013).

There are several preparation techniques for termites that are practiced all over central and southern Africa. It is very popular and easy to fry the termites in their own fat. Fried termites are very high in protein. Also, they are often roasted or boiled and then dried. Whether they are either sun-dried, smoke-dried or both, depends on the weather. In eastern Africa, you can find sun-dried termites on local markets, when they are in season (Van Huis et al., 2013).

However some means of termite-preparation are wide spread, they can also be distinctive for African food cultures. In Uganda, for example, people prefer to steam the termites in banana leaves. The Azande people, who live in the Democratic Republic of Congo, South-Sudan and the south east of the Central African Republic have their own preparation methods. First, they crush the termites with a pestle and mortar and eat them with honey. The pygmies, who live in the Central African Republic, are also known to eat their termites this way. Pygmies also use the oil that is pressed out of dried termites or left over from frying for other purposes. They save it in pots and tubes and use it to treat their body and hair. In

Botswana, winged termites are caught by women and roasted in hot ash and sand before consumption (Van Huis et al., 2013)

Collecting termites still is done in a traditional way in most places. In some parts of the Democratic Republic of Congo, people cover the holes of the termite nest with banana or maranta leaves or a blanket and leave only one single opening open. The fleeing termites find this as the only way out, making it very easy to collect the termites in a basket that is put next to this opening. In Uganda, they put pipes from the entrance holes to a basket or a net in which the termites will end up. It is also been said that beating on the ground around the termite nests will trigger them to come outside; the termites will think it is raining (Van Huis et al., 2013).

Also, the family of the stink bug, *pentatomidae,* is eaten throughout Africa, particularly in southern Africa. In the Republic of Sudan, the *Agonoscelis versicolor* causes great damage to sorghum crops. In order to safeguard the crops, they are eaten when they are abundant and threatening the yield. Just like from the termites, oil is derived from these insects, which is then used in preparing other foods.
In Southern Africa, stink bugs are generally eaten raw, roasted or cooked. After washing the bug, the leftover water is used as a pesticide. The heads of the bugs are removed by squeezing the body from the back to the front. This is done in order to remove the unpleasantly smelling substance that they excrete (DeFoliart, 1999).

In the food cultures of Democratic Republic of Congo, Nigeria and Cameroon, palm weevil larvae are very popular. They are collected, washed and fried with onion, pepper and salt before they are consumed. They are very high in fat and do not need extra oil when they are being fried.

In the food cultures of more urban areas in Africa, insects are eaten as take-away foods. They are offered in local restaurants and stalls and provide inexpensive food that is fit for a daily diet. This street food is very popular because of its low cost and convenience. Street markets have existed for hundreds of years and the foods that are provided there, generally reflect the characteristics of the local food culture. According to Van Huis et al. (2013) is the economic contribution to the local society considerable, but vastly underestimated or neglected.

Literature on the consumption of other insect species in Africa is lacking, but it is recorded that grasshoppers are also common food in many parts in eastern and southern Africa (Van Huis et al., 2013).

3.2b Entomophagy and livelihood sustainability in Africa

Since especially the mopane caterpillars form such a substantial part of the food culture in many African countries, its harvesting, preparing and trade are a big part of daily life. Food, and in this case, insects, is a

big binding factor in society. In many countries, the agricultural sector still accounts for the livelihoods of many households. Like so, the harvesting of insects contributes to sustainable livelihoods for many households in Africa (DeFoliart, 1999).

Since a good provision of food and a well-functioning community go together, there is always a need for cooperation in order to manage natural sustainability. For instance, caterpillar populations differ from year to year and therefore need close monitoring in order to maintain a sustainable population that can survive; so there will also be caterpillars to be harvested next year. It is important to make agreements within the society to set a maximum amount of caterpillars to be harvested. This depends on the type of weather and how the caterpillar population develops (Latham, 2003).

The collecting, processing, trading and consuming of the caterpillar is a central part of the local food cultures in Africa, but most of all, it forms a central part of livelihood strategies for marginalized groups (Illgner and Nel, 2000). Usually, the women and children collect the caterpillars by hand, which is a safe and easy, though time-consuming task. Then, they are degutted, boiled and left to dry in the sun. When dried, mopane caterpillars can last for months and can therefore be a very valuable source of nutrition in lean times. For most rural families, the harvesting and trading of mopane caterpillars forms a substantial part of daily incomes. The high value of the caterpillars is often an incentive to start harvesting them for a living. According to Munthali and Mughogo (1992), they provide a higher income for rural households than conventional crops, which is used for purchasing primary goods such as clothing and school materials. Because the incentives to start harvesting mopane caterpillars are so high, many people travel even hundreds of kilometres through the mopane woodlands to find the insects (Kozanayi and Frost, 2002).

According to the research of Mbata et al. (2002), described above, it appeared that in northern Zambia, the caterpillars were harvested from regenerating woodlands in areas that were previously cleared for cultivation and later on left fallow. The lands that need time to re-generate are not able to provide any crops, but do provide in nutritious, protein-rich caterpillars. These caterpillars are used for private consumption, but are also traded outside local communities and even national borders. It is recorded that mopane caterpillars from southern Zimbabwe are traded to Botswana, South Africa, Zambia and the Democratic Republic of Congo. Unfortunately, there is little detailed information about the trade available since it is predominantly informal and in some cases even illegal.

The intercontinental trade of caterpillars is however, better documented. Most of the mopane caterpillars that are exported from Africa, go to Europe; Belgium and France import an estimated 3 and 5 tonnes annually. Especially Congo partakes in this extensive export trade. Most of the consumers in Belgium and France are recorded to be Congolese immigrants.

The trade of the mopane caterpillars in Zimbabwe boomed in the 1990s and this has had severe consequences for caterpillar populations (Toms & Thagwana, 2005). In general, there is a lot of poverty in Zimbabwe. Due to the high demand and value of mopane caterpillars, people felt a pressure to harvest as much as possible, which generally led to unsustainable use. Because there were less and less caterpillars to survive, the populations in the subsequent years dropped. In general, this eventually lead to more poverty, food insecurity and environmental problems (Toms & Thagwana, 2005).

In many Zimbabwean food cultures, there was a harvest season for collecting caterpillars in the past. But the incentive to overharvest due to poverty became so high that this restraint had decreasing influence on the local community. The problems are so severe right now, that even if environmental conditions – such as the weather – are optimal, populations are unlikely to recover (Van Huis et al., 2013). If there are not taken any measures, mopane caterpillar populations will continue to decline and so will the livelihood sustainability of the Zimbabwean people that live of the caterpillar trade. Many people are well aware, however, that overharvesting can harm the woodlands and that reliable protection measures are desired (Van Huis et al., 2013).

All over the world, women are active in the collecting, processing and selling of many non-wood forest products; in this case, insects. Their livelihoods depend on them, as the sale provides them with income. According to Van Huis et al. (2013), 94 percent of the non-wood forest product traders in Cameroon were women. The same report says that more women than men were participating in the bushmeat trade, representing 80 percent of all traders. Most of the time, however, these tasks are seen as informal activities for several reasons; women also have certain responsibilities to their households which restrain them from participating in formal economies; women are usually uneducated and unskilled and the income derived from the sale on informal markets are used for household expenses instead of for investment into the business.

Women and children fulfil important roles in the non-wood forest product sector, mainly because harvesting, processing and selling are easy tasks to perform and market entry is easy. Even though women are the main sellers of insects on a smaller scale, the more profitable long-distance and large-scale trade is dominated by men, who do not have the obligations of the household like the women do. Most women collectors are from small communities and have always been highly immobile (Van Huis et al., 2013).

3.2c Changing food cultures in Africa

Unfortunately, there are few reliable sources concerning this topic. However, Obopile and Seeletso (2013) researched the status of entomophagy in Botswana by performing interviews and assessing the popularity of certain edible insects among different age groups. The interviews were carried out in six different areas in Botswana and consisted of a questionnaire with open questions. A total 72 people were interviewed in

either English or their local language. They were asked to list the names of insects that were known to be eaten in their area, in present times and in the past. The respondents were showed images of different insect species and were asked to name them. They were also asked about basic demographic facts, such as their age, gender, education and how the different insects were processed and eaten.

The majority of the respondents were between the age of 45 and 55 and did not have any formal education. The species and number of insect species that were eaten in the different areas differed greatly among the districts. Some insects were eaten in all districts and the most popular one appeared to be the mopane caterpillar, the second most popular edible insect were termites.

A remarkable outcome of the experiment was that even though 85% of the respondents had eaten insects before, only 34% had done so in the last 12 months. 58% Of the respondents had eaten insects a very long time ago and only 8% ate them recently. Unfortunately, no clear reasons for this are provided in the research report. When the respondents were asked if they would prefer insects over other foods, most of the respondents said that they would do so. The majority of these people said that the taste of the insects was the most important factor in this choice.

Another remarkable outcome of the study was that most respondents mentioned a decline in entomophagy in Botswana (94%) even though most of them were positive about eating insects. Several reasons for this are given in the article. First of all, the authors state that the more intensive, mono-culture style of farming that is increasingly used in Botswana has a negative effect on the amount of edible insects available. This sounds very plausible, but the authors do not use any sort of proof to underpin this assumption. The second reason that the authors give for declining entomophagy in Botswana, is that it is the result of overharvesting in previous decades. This statement however is supported by many other researchers. The final reason that the authors provide, is that of the increasing influence of Western food cultures on the Batswana culture. Increasingly, people switch to fast foods, leading to a loss in traditional lifestyle and food cultures. However, most respondents were positive about the idea of eating insects and were willing to support the consumption of insects in their community, especially among the younger generations. The authors state that a more sustainable supply of edible insects must be realized in order to achieve this.

The outcomes of a single survey on Batswana food culture cannot simply be generalised for the whole of Africa. However, Obopile and Seeletso are not alone in their statement that insect consumption is declining. This is also mentioned by Van Huis et al. (2013) but still, it is insufficiently investigated. There needs to be more research on this matter, as insects have proven themselves to be an environmental friendly and nutritious source of protein.

3.3 Asia

Like in Latin American and in African food cultures, the act of entomophagy in Asian food cultures dates back for many centuries. There are ancient records that state that in 120 B.C., cicadas, wasps and ants were popular foods among Chinese emperors and that this custom was passed on from generation to generation. Over time, the selection of species eaten by Chinese grew. Some fly species, beetle larvae and later on also silkworms and dragonflies gained popularity in Chinese food cultures (Zhi-Yi, 1996). Up to today, insects form a substantial part of the food diet in many parts of the Asian continent. Insects are part of food cultures in amongst others China, Korea, Japan, Lao, Northern India, Cambodia, Thailand and Indonesia (Van Huis et al., 2013).

3.3a Entomophagy in Asian food culture

In China, crickets play an important role and are more than just as ingredient for traditional dishes. In ancient China, they were appreciated for their melodious chirping and for this reasons kept as pets. As a food, in most Asian food cultures the cricket is preferred because of its soft body (Van Huis et al., 2013). In many Asian food cultures, they are preferred fried with sugar and several types of sauce (Zhi-Yi, 1996). Also in Thailand, Lao and Cambodia crickets are very popular (Van Huis et al., 2013). In Thailand and Lao, crickets are farmed for consumption as a result of high demand (Boongird, 2010; Van Huis et al., 2013).

Water beetles such as the *Dytiscid* and *Hydrophilid,* are a popular part of the Cantonese food culture in China. Both beetle species are consumed as candy and as a medicine; they are considered as an antidiuretic. The beetles are cooked in hot salty water and the elytra, legs and other hard parts are removed before consumption (Bodenheimer, 1951). Also in Thai food cultures, water beetles are eaten on a relatively high scale, they are eaten roasted and processed into a curry (Siriamornpun & Thammapat, 2008).

Silkworm pupae form a distinctive part of the food cultures in North-Eastern China. The harvesting of the silk cocoons is usually done by girls, who work very long shifts in the silk production sector. The pupae are put into very hot water and form a nutritious supply of food during the working day. Also, silkworm pupae are roasted and sold on food stalls in the streets. When the weather is fit, the silkworm pupae are left to dry in the sun, after which they can be stored for about a year (Bodenheimer, 1951). The silkworm is considered a delicacy, not only in Chinese, but also in Japanese, Vietnamese and Thai food cultures. In Korean food cultures, they are processed into medicines as they are considered to be healthy for diabetics; they have a lowering effect on blood glucose (Van Huis et al., 2013).

Wasps and their larvae and pupae are also edible and part of several food cultures in China since ancient times. There are books from the Tang dynasty (618-907) that describe techniques for collecting and

cooking wasps. They are also eaten in Japan and Thailand. In China, they are most commonly consumed in the southwest and they are sold on local markets in summer and autumn (Ying, Xiaoming, Long & Zhiyong, 2010). They are also often served in restaurants throughout the country. The most common way to prepare the wasps is to deep fry them, or to fry them with chicken eggs. Preparation methods however are not uniform over the country. The Dai people in Yunnan province prefer to steam the wasps and mix them with vinegar (Ying et al., 2010). Despite the popularity of edible wasps, research on the topic is vastly insufficient according to Ying et al. (2010).

In Japan, the larvae of the yellow jacket wasp are a popular food and are also known as 'hebo'. Often, the local supply of larvae is not sufficient to keep up with the demand and additional larvae have to be imported from Australia and Vietnam (Van Huis et al., 2013).

Among many ant species that are edible, there is the weaver ant, which is considered a delicacy in almost all food cultures throughout South-East Asia. They are increasingly being sold in cans in Thailand and distributed in southeast China, India, Sri Lanka, Malaysia and Bangladesh. It is also used as a dietary supplement and processed into a myriad of trendy health foods in China (Van Huis et al., 2013). Ants are very nutritious and demands are high. The average Thai household consumes about 49 kilograms of ant larvae and pupae per year (Van Huis et al., 2013). The eggs of the red ant are considered a delicacy and is highly expensive, like caviar is in many Western countries. They are eaten only during a short period – during the end of the cool season and the beginning of the hot season (Somnasang, Moreno & Chusil 1998). Usually, they are fried and eaten in a salad or with a vegetable curry (Siriamornpun & Thammapat, 2008).

A remarkable note is that despite its popularity in many South-Eastern Asian countries, ants are considered a food taboo in Indonesia, where the majority of the population is Muslim. Ants are called *haram* by the Muslims, which can literally be translated into 'sinful' or 'immoral'. For this reason, they are not eaten by Indonesian people. They are collected though, as feed for songbirds. They provide good money for many families, but fundamental Muslims also see the act of collecting ants to sell as feed *haram* (Césard, 2004). This relates to Chapter 2, which discusses and shows the important influence of religion on food taboos.

Not only ants are popular insects within the Thai food culture. For example, cicadas are eaten in many different ways; roasted, fried and dipped in chili paste or chopped into a curry. Silk worm pupae are eaten fried, steamed and served with chili paste or in a curry with vegetables. Bamboo caterpillars are also desired for their taste and prepared more or less the same as silk worm pupae (Siriamornpun & Thammapat, 2008).

Also Laotian food culture is well known for the importance attributed to edible insects. For example, cicadas are very popular and are locally known as 'Chak Chan'. Other insect species that are part of the food culture in Lao are termites, bamboo caterpillars, wasps, dragonflies, crickets, stink bugs and the giant water bug (Hanboonsong & Durst, 2014). Unfortunately, there is insufficient information available about the cultural values and preparation methods of these insects in Lao. Other places where insects are a part of several local food cultures are Vietnam, Cambodia and North-East India (Van Huis et al., 2013).

3.3b Entomophagy and livelihood sustainability in Asia

Insects are a big part of the Asian food culture and the demand for them is continuously high. Not all insects are available every season, though. However, in some Asian countries, insects are domesticated for farming. For example in Vientane, on the border of Lao and Thailand, there are cricket farms set up with aid from the Food and Agriculture Organization of the United Nations [FAO] (Hanboonsong & Durst, 2014). Originally, insects were collected in the forest and in fields. Over time, insect populations appeared to decline. Reasons for this were changing land use, climate change and the development of commercial farming. To ensure a stable and constant supply of edible insects that are safe and ready to consume, insect farms were established. Not only are several insect species easy to farm, they also need far less space and feed than livestock such as cows, pigs or chickens. Four insect species are now farmed in Lao: mealworms, palm weevils, weaver ants and house crickets. Training courses were given to the future insect farmers by the FAO and students of the National University of Lao. One of the farmers in the FAO project, is Mr. Kongkeo. He grows vegetables for retail and started cricket farming in 2010 with aid from the FAO. He produces around 26 kilogram of crickets, every 45 days which he sells at the market for 50 000 kip per kilogram. Mr. Kongkeo's farm is very successful and he is planning to expand his production (Hanboonsong & Durst, 2014). Mr. Kongkeo is only one of the several people that were engaged in the project. Though, he is not the only one who profits from the farm. Most insect farmers say they earn a nice amount of money which is useful for them and their family. Some of them earn even more than traditional crop or cattle farmers. According to them, it is very simple to farm insects and anyone can do it (Hanboonsong & Durst, 2014).

In Thailand and Lao, also ants contribute to the livelihoods of many people. During the collecting season, between February and April, many people go looking for ant nests, as they are considered as open access. The harvesting of ants is mainly done by women, who then either prepare them for private consumption or sell them on local markets. The sale of ants can make up for a rough 30 percent of the total annual household income – even though collecting them is not a very tiring and heavy task. Not only are ants a viable source of income, they are also very nutritious; per 100 gram, larvae and pupae provide 7 gram of protein and 79.2 kcal of energy (Van Huis et al., 2013). According to Offenberg (2011), they are also a very viable species to farm.

The silkworm is also a popular product in several Asian countries. Not only does it produce valuable silk, but its pupae are extremely nutritious due to their high protein values. They are considered to be a delicacy in China, Thailand, Vietnam and Japan and are very valuable for these reasons. Many Thai households – an estimated 137 000 – raise silkworms and thus contribute to a rough 80 percent of the total silkworm production in Thailand and to the livelihoods of many poor households (Van Huis et al., 2013).

Gahukar (2012) pleads for a higher insect consumption in India, where over 65% of the people lives in rural areas where food supply is insufficient. As edible insects are highly nutritious, relatively easy and cheap to cultivate and cause little stress on the environment, they are considered a viable source of nutrients for the poor and hungry in India. In North-Eastern India, insects are already consumed on a relatively small scale, bees in particular (Gahukar, 2012).

3.3c Changing food cultures in Asia

In general, Asia is becoming a more influential player on the world market and its economy is blossoming. The middle class in many Asian countries – especially India and China – is growing, and as a natural result, food cultures are changing too. According to Engel's law, the proportion of income spent on food will decrease when income rises – even when total expenditures on food increase. Bennett builds his law upon this; Bennett's Law states that the proportion of the consumption of starchy foods such as beans and potatoes decreases as income increases (Reardon & Timmer, 2014). The total consumption of meat in upcoming economies such as China and India is increasing (Chen & Abler, 2014). It appears that developing economies that are increasingly exposed to Western food cultures, tend to take over a myriad of Western food habits. An example of this, is the increasing popularity of McDonald's in – amongst others – Asian countries (Watson, 1997).

As Western lifestyles are gaining popularity, it might seem natural that entomophagy decreases. This has been reported, but never truly investigated in Asia (Van Huis et al., 2013). The loss of traditional food cultures and therewith, entomophagy, might not seem a problematic issue at first sight since the quality of life improves for a lot of people. However the increase of livestock held for meat production poses a big and rapidly increasing stress on the environment. Entomophagy however, is far more sustainable and besides that, nutritious and healthy. I would recommend to perform more research on the changing food cultures in Asia and the consequences of these phenomena.

3.4 Conclusion

So, how is entomophagy part of food cultures? The most important, overall conclusion that can be taken from the third chapter, is that it is not possible and not right to generalize cultural habits and ideas – apart from the fact that it is simply unnecessary. While studying the topic of entomophagy in food cultures, I

found that food cultures differ greatly over the world; not to mention that within continents and even countries, there are big differences in food cultures. The fact that food cultures differ greatly provides an interesting basis for this thesis; as knowledge on these differences can provide insights on the mechanism of food cultures in general. An important link to the second chapter, is the value of the insects that determine the attitude of the people towards them. Kellert (1993) discusses that feelings of disgust towards insects decrease in the case of acknowledged positive values, such as aesthetic, ecological or practical. In the food cultures discussed in this chapter, we find that a. the insects that are eaten are highly valued and b. they do contribute in a functional and ecological way to the livelihoods of these people.

Of all Latin American food cultures, insects play the biggest role in Mexican food cultures. Also in Ecuador insects are eaten and, on a lesser scale, in more remote areas of Latin America such as the Amazon basin. The supply of edible insects in Latin American food culture is fairly rich and insects are not only eaten in poor areas – some species are of high gastronomical value. What becomes clear while researching the available literature, is that due to high demand for the insects, people become exploited. There is very little regulation on the trade of edible insects and there is need for monitoring in order to ensure the insect collectors a fair income and a chance for a sustainable livelihood. Another striking aspect of the Latin American insect trade, is the booming demand for cochineal dyes. In a certain way, the lice are perhaps not considered part of entomophagy since only their red dye is used, but it does contribute to the economy and people's livelihoods in myriad ways. As influences by Western food cultures increase in many places in Latin America, entomophagy is believed to decrease among its citizens. In Latin America, entomophagy is still practiced mainly in rural areas, away from influences by Western food cultures - except for Mexico, where insects are part of the national food culture.

As for African food cultures, especially the mopane caterpillar is important. It contributes widely to local economies and is even exported to emigrants outside of Africa. People travel hundreds of kilometers to collect them. A tribe has extensive rituals concerning the caterpillars. Although food cultures differ greatly within Africa, we can conclude that for most of them, this caterpillar is of great importance as it not only contributes to food security, but also to the economy. Apart from the caterpillars, many other insects are consumed throughout the area. It is interesting to discover that a certain insect that is consumed in many places, is prepared and eaten in many different ways. Like in Latin America, entomophagy contributes to the livelihoods of many people in Africa; it provides an income and a nutritious addition to the daily diets. There are several rules, regulations and taboos concerning the harvest and consumption of edible insects to safeguard the sustainability of the ecology and insect population. In Botswana, it is proven that the demand for edible insects, is decreasing, however. It is unclear how this is developing in the rest of Africa.

In Asia, many insects are eaten on a great scale, in many countries. Especially crickets are popular, but also ants and silkworm pupae are highly demanded. A striking detail is that in Indonesia, several insects – and in particular, ants – are considered to be *haram* and are therefore not eaten in the region. Religion is a fundamental aspect of culture in many countries and dictates what to eat and what not to eat in most

cases. It proves that food goes together with ethics, norms and values. In many other Asian countries than Indonesia, insects provide for livelihoods as well. The FAO project in which cricket farms were set up in Lao are proven to be very profitable; in general, at least as profitable as the farms in the region. Food taboos not only are present in Africa, in Indonesia eating insects in general is considered 'haram' by the Muslim people. Therefore, they are not eaten. Again, this links to the second chapter, in which the religious influence on taboos was discussed.

As the economies of several Asian countries – and in particular China and India – are growing exponentially, the middle class is growing as well. With this growth in wealth, a change in diets is nearly inevitable. It is clear that the demand for meat like veal, chicken and pork is increasing and the environmental consequences will be severe. It seems acceptable, although it is not proven, that entomophagy is declining.

These three continents have something in common when it comes to insects in the different food cultures. In Asia, Latin America and Africa, insects are seen as a valuable contributor to local and national markets and livelihood sustainability and feelings of fear and aversion are barely an issue. This makes an interesting link to the findings of Kellert (1993) (see paragraph 2.2). He states that there is a general feeling of disgust, unless the invertebrate has certain positive aesthetic, practical or ecological values. Since these values for insects are higher for the countries where entomophagy is part of the food culture, this is in line with the findings in this third chapter. In the food cultures in the regions that were discussed in this chapter, insects are considered to have a high functional or ecological value – which, according to Kellert (1993), contribute to a more positive attitude towards them.

Also, a link can be made with the theory on food taboos (see paragraph 2.4). The food taboos and rules found in this chapter also relate to this. For instance, it was prohibited to harvest insects outside of the season, which eventually would lead to degradation of the insect population and the environment. Also, these taboos link to the provision of food for the community; in China, using land for cow meat was a taboo because it would lead to less food for everyone. The same counts for the caterpillar harvesting taboo in Africa.

What can be concluded about these food cultures in general, is that the practices of entomophagy are deeply embedded. They are so entwined in daily practices that there is not just one single reason that says: this is the one definite reason why insects are part of these food cultures. It is much more complex than that. Insects provide protein, they provide income, social security and shape the relations within the community.

The fact that increasing influences of Western food cultures seem to cause a decrease on entomophagy in these regions – although not completely proven, is interesting. Western lifestyles are desired in many poorer regions of the world, as they exhume an air of status and wealth. McDonald's is becoming bigger and stands synonymous for globalization. It appears that food cultures are not static - they are sensitive to

trends and influences from other food cultures. This is definitely food for thought and will be discussed in the coming chapters.

4. Introducing insects in Western food cultures

Already in 1885, the British author Vincent M. Holt argued for entomophagy in Britain (Van Huis et al., 2013). Despite his attempts, eating insects never gained popularity among the British citizens. As discussed in the previous chapter, in Western food cultures, insects are generally seen as pests, disease-spreading 'creepy crawlers'. The most logical question that follows, is: what can be done to effectively change the perception of insects and promote entomophagy successfully?

In this chapter, I will first elaborate on food neophobia – the fear of trying new foods. Insights on how neophobia works, can help to design strategies that target the origin of the fear to try edible insects. Then, I will elaborate on a case study on the introduction of a novel food in Western food cultures – sushi. It was first viewed with scrutiny and disdain, but turned out to be a popular food, synonymous to a cosmopolitan way of living (Sakamoto & Allen, 2011). Finally, I will discuss the findings of this chapter relate them to possible strategies to overcome the fear and feelings of disgust towards insects.

4.1 The mechanisms of food neophobia

As discussed in Chapter 2 , people often feel ambivalent about trying novel foods. On the one hand, there is neophilia; excitement and curiosity about trying the new food. On the other hand, people tend to avoid new foods or approach them with scrutiny – this is called neophobia (Haidt et al., 1997). Through gaining insights in neophobia, we learn how (not) to approach people with novel foods like edible insects.

Axelson (1986) remarked that food cultures are passed on from generation to generation, but also that there are differences within society. Food neophobia may thus differ among different people. In order to measure the degree of neophobia in individuals, Pliner and Hobden (1992) developed the Food Neophobia Scale [FNS]. The participants indicated their level of agreement with a range of novel and familiar foods. The higher the score on the FNS, the higher the degree of neophobia and the lesser the willingness to try new foods. The FNS has frequently been used as a tool in order to examine the liking of novel foods and the willingness to try them (Martins, Pelchat, & Pliner, 1997; Raudenbush & Frank, 1999). According to Pliner and Salvy (2006), evidence has shown that the willingness to try new ethnic foods relates to FNS scores. They argue that it is absolutely necessary to investigate the degree of neophobia towards a novel product before introducing it in the market (Pliner & Salvy, 2006).

Birch (1999) says people tend to be more neophobic than neophilic (keen to try new foods). Seen from an evolutionary perspective, this might be a good thing as it decreases the chance that people eat something that is not good for their health. But as discussed in both Chapter 2 and Chapter 3, food cultures may change and novel foods may make its way into the diets of people. This means that degree of neophobia can be influenced. Another interesting remark is that there appears to be a strong positive correlation between the score on the Food Neophobia Scale and the degree of disgust someone feels towards a novel

food product (Pliner & Salvy, 2006). This means that decreasing the feelings of disgust, will decrease the level of neophobia.

Foods that are accepted, are those that people expect to be beneficial for the health and to taste good (Rozin, 1988). Indirect information about the taste or benefits of a novel food, has proven to have a lowering effect on the level of neophobia and an increased willingness to try the novel food. For example, when others say it tastes good or is good for your health, people appear to be more willing to try novel foods (Pliner & Salvy, 2006). That is, however, only when the novel foods were either relevant or important for the participants. In the case of disgust, positive information about the benefits and taste have proven to be ineffective (Pelchat & Pliner, 1995).

Direct information, that is, from experience may have a positive effect on the level of neophobia. People tend to generalize their experience; a positive experience in a novel food decreases the overall level of neophobia (Pliner & Salvy, 2006). Loewen and Pliner (2000) researched the effect of generalization through direct experience with novel foods. Children from the age of 7-9 and 10-12 were exposed to good tasting novel, good tasting familiar and bad tasting novel foods. The groups of older children that tried the good tasting novel foods had a decreased level of neophobia afterwards and increased willingness to try novel foods in comparison to the control group that tried good tasting familiar. A remarkable outcome was, that for the older children, trying the bad tasting novel foods had no influence whatsoever on their willingness to try novel foods. For younger children, trying both good-tasting and bad-tasting novel foods had a decreasing effect on their willingness to try novel foods (Loewen & Pliner, 2000). It has also been proven that in general, adults are more willing to try novel foods (Pliner & Salvy, 2006).

Several studies pointed out that social influence has a big influence on the acceptance and liking of novel foods (Marinho, 1940; Duncker, 1938). In these studies, people followed a 'lead model', liking and choosing the same foods. According to Harper and Sanders (1975), children accepted novel foods more easily when they saw their mother eating it. Acceptance and willingness to try novel foods increase when the role models are enthusiastic about them (Hendy & Raudenbusch, 2000).

Also, neophobia tends to be higher when the novel foods concerned are of animal origin (Pliner & Pelchat, 1995). Rozin and Fallon (1983) researched the reactions towards novel animal foods and they noticed that these reactions were very similar to the reactions shown towards foods that were typically considered disgusting. Notably, children in the age group of 5 to 11 showed similar reactions towards novel foods that were both of animal and non-animal origin. Disgust as a means of rejection for novel foods is not fully developed for children this age, which might explain the indifference for animal and non-animal novel foods in younger children (Pliner & Salvy, 2006).

4.2 The acceptance of novel foods

But how do acceptances of novel foods take place? It is for sure that Western food cultures have changed drastically over the past century. As discussed in the previous chapter, it was mainly due to agricultural development that the production of food became industrialized and most of the foods consumed are now factory products. However, not only have supermarkets and take-away restaurants like MacDonald's and Burger King influenced the way Westerners cook and eat – food is supposed to be prepared easily and fast as possible – they also influenced what we eat. A hundred years ago, the Dutch food culture used to consist out of eating mainly tubers and potatoes and the occasional piece of meat or apple. Nowadays, the Dutch consume not only potatoes, but also pasta and rice. Since the seventies, Asian, Turkish and Greek food restaurants, run by immigrants, have popped up all over the Netherlands and the rest of Western world and gained great popularity. Some of these restaurants managed to develop themselves in to big, successful companies – like the Döner Company in Western Europe and Taco Bell in Northern America. It can be said that the increased globalisation has not only influenced the food cultures in Asia, Africa and Latin America (see Chapter 2), but also the Western food cultures.

In order to understand how exotic foods have made their way into the Western food cultures, I will elaborate on a case study about sushi. Sushi is a Japanese cuisine, in which mainly seaweed, rice and raw fish are being used. In many Western food cultures, raw fish was never considered to be foodstuff. Except for the raw herring eaten in the Netherlands, there are no reports of raw fish being eaten in the Western world before the arrival of sushi. The first sushi restaurants outside of Japan opened their doors in the sixties on the west coast of the USA by Japanese immigrants (Sakamoto and Allen, 2011). In the seventies, sushi slowly started to gain popularity, to become a million dollar business in the years thereafter (Edwards, 2012). Sushi was often described as 'cutting edge', 'original', 'chic' and 'innovative'. The sushi fever started in California – UCLA students ate sushi rolls because it was considered 'cool'. The hype spread all over the United States, especially among the so-called 'young urban professionals'; eating sushi became synonymous for a cosmopolitan lifestyle. Hollywood celebrities and wealthy, highly educated people were considered to be the major target group for sushi restaurants (Sakamoto and Allen, 2011). It was not until long before the first 'American sushi' restaurants popped up, providing the larger public with all sorts of fusion sushi, adapted to the taste of the Americans. For instance, you have the California rolls that have rice, cucumber, (imitation) crab and avocado. Sometimes, the *nori* is on the inside of the roll, as some Americans are a bit prude about eating the seaweed. The Philadelphia contains rice, smoked salmon and cream cheese. Even more 'American' is the peanut butter-jelly roll (Edwards, 2012). This adjustment to local cultures is similar to how McDonald's has 'glocalised' all over the world. In McDonald's restaurants in Japan, the shrimp burgers and teriyaki burgers are in great demand (Watson, 1997).

Barrena and Sánchez (2013) researched how people accepted innovative foods by exposing them to innovative and well-known products and having in-depth interviews with the respondents. They found out that apart from the taste, the degree of recognition and the nature of the food are important factors influencing the willingness to try the new food. As discussed before, products of animal-origin are subject

to higher levels of neophobia (see also Loewen & Pliner, 2000). Also, socio-demographic variables are of influence on the degree of neophobia; younger people are more willing to try new products than older people. This forms a notable contrast with the findings of Kellert, who found that especially older people are more likely to be open to novel foods. The description of the age groups in both the work of Barrena and Sánchez and Kellert were not accurate (i.e. the exact age groups of the respondents were not mentioned, strangely enough) so this topic requires some more research. The residence of the respondents also appeared to be relevant; urban citizens were more likely to accept novel foods than rural citizens. Consumers appeared to adopt innovative food products for varieties of reasons; because a product was easy to prepare, had a nice appearance, tastes good and was of high nutritional value. A novel food product that contributed to a sense of social belonging and cultural identity was also more likely to be accepted. Barrena and Sánchez (2013) also pointed out that providing information about the product (especially on its label) would contribute positively to its acceptance. According to the respondents, the label on the product was more effective when it provided information about the nutritional values and a sense of social belonging for those who bought it.

4.3 Improving the Western attitude towards insects

Overcoming the cultural barrier on eating insects in the Western world will require tailored strategies because, as discussed in chapter 2, the negative attitude towards insects is embedded in many different aspects of culture. People regard insects with contempt as they are believed to be harmful for agriculture and for human health, amongst other reasons. As discussed earlier in this Chapter, simply providing information about good taste will not contribute to a lower degree of neophobia towards edible insects – the feeling of disgust must be targeted first (Pelchat & Pliner, 1995).

Trifling about how sushi became part of the Western food cultures, is how people that were considered to be cool – yuppies and Hollywood celebrities – influenced the people in the Western world to eat sushi. The trend trickled down from the higher social classes to the rest of the Western food cultures. Not only sushi made its way into Western food cultures this way. The widely-consumed lettuce 'Lollo Rosso' was unknown by the majority of the Western people and it did not gain popularity until some Michelin-starred restaurants started using it. Nowadays, the Lollo Rosso is available in almost every supermarket (Wind, personal communication). Pierre Wind, Dutch chef, argues that the barrier for entomophagy in the Western world can be overcome in a similar way. When it is introduced in good, high-end restaurants with famous chefs, insects will soon gain positive attention by the upper social classes – celebrities, socialites and other successful people promote entomophagy by participating in it. As discussed in Chapter 2, food taboos and customs also characterise the identity of social groups. It is attractive to participate in your role models' taboos and customs if you want to belong to the same social group. Because people often wish to identify with those who are considered beautiful and successful, they are likely to copy their behaviour (Meyer-Rochow, 2009). Also, several investigations have proven that a sense of social belonging is a great

contributor to the acceptation of novel foods (Barrena & Sánchez, 2000; Marinho, 1940; Duncker, 1938; Harper & Sanders, 1975; Hendy & Raudenbusch, 2000).

The sushi example not only showed that role models but also adjusting the sushi to American preferences contributed to the growing popularity of sushi in America. This trend of glocalisation can be found in different strategies of global food enterprises, especially in McDonalds (Watson, 1997). Unfortunately there is no information available about glocalisation in relation to promoting entomophagy, but it certainly asks for more investigation as this might lead to a successful strategy. Barrena and Sánchez (2013) however did point out that recognition is an important aspect in the acceptance of innovative foods.

Getting high-end restaurants and celebrities involved into entomophagy is one way to help Western food cultures overcome the barrier for eating insects. However, as discussed in the previous chapter, the feelings of disgust are rooted deeply in several aspects of society that require a tailored approach. Also, the degree neophobia is proven to be higher when it comes to novel food products that are of animal origin.

Kellert (1993) argued, as discussed in Chapter 2, that people fear insects because they tend to both generalize the harmful species and do not know a lot about them. People tend to fear what they do not know and education could help in this part (Kellert, 1993). The so-called 'bug-banquets' have been proposed as a solution to this problem (Looy & Wood, 2006). These bug-banquets consist out of a presentation about insects as food and the opportunity to taste them. Values and emotions are a lot more closely linked to environmental friendly behaviour than factual arguments (Grob, 1995). Therefore, it seems like a logical idea to not only tell people about edible insects, but also expose them to it. Looy and Wood (2006) decided to evaluate the effectiveness of these bug-banquets. A test group and a control group were taken from a junior high school, a regular high school and a university (in Alberta, Canada). A pre-test and a post-test were taken, these both consisted out of a questionnaire testing the factors of disgust as proposed by Kellert (1993; see also Chapter 2) and a FNS questionnaire. In general, the university students showed a positive result; their attitudes were more positive in the post-test and FNS scores. The junior high school students and high school students however, changed either very little in their attitudes or slightly negatively in the questionnaires and FNS scores. Most respondents noted in the post-test evaluation that the presentation made a difference and that they appreciated insects more after the bug-banquet. Pierre Wind (personal communication, July 4, 2014) noticed that especially children were quite eager to try new foods, amongst others mealworms and other insects. The same can be seen in Barrena and Sánchez' (2013) statements; older people are not so keen on innovative food products. This is a quite remarkable observation, as several researches point out that older people are less neophobic (Looy & Wood, 2006; Pliner & Salvy, 2006). These contradictory findings show that the negative attitude towards insects is a very complicated one and it definitely asks for more research. As Looy and Wood (2006) note: "*A single presentation cannot override years of enculturation in a different direction"* (p. 47). Scientists are however not without hope for the future: "*..participants did report changes in their awareness of the role of invertebrates, the possibility of using them as food and a willingness to consider changing their behaviour under appropriate*

circumstances" (Looy & Wood, 2006, p. 47). Pliner and Salvy (2006) state that it might be difficult to convince people that this novel food may be good to eat, but it is definitely not impossible. Wind confirms this: "*It is definitely possible for Western food cultures to cross the cultural barrier of disgust, it will however need quite some time."* (Personal communication, July 4, 2014).

According to Van Huis et al. (2013), does the acceptance of insects in Western food cultures depend on at least two crucial aspects; availability and learning. Making insects available will be a challenge, but not the biggest problem. In July 2014, Wageningen UR and the edible insect distributor DeliBugs opened InsectPoint, a cricket farm and research centre for edible insects. A bigger challenge is the education aspect, of which bug-banquets are one of the many possibilities. Van Huis et al. (2013) argue that education is needed on more platforms. They distinguish three approaches in education; formal education such as primary, secondary and higher education; informal education through traditional and online media and non-formal education, that is, from amongst others NGOs and nature centres. In Wageningen, the entomology department organises courses in 'Insects and Society', which appears to be very popular among students (Van Huis et al., 2013). Also NGOs play a big role in raising awareness for edible insects; promoting insects as both source of livelihood sustainability and their nutritional and ecological value. NGOs have the power to place edible insects on the political agenda in both developed and developing countries. They can assist people in insect rearing and entrepreneurship (Van Huis et al., 2013). Informal sources of education on entomophagy are amongst others the popular insect blog 'Girl meets Bug', where Daniella Martin shares her favourite recipes with edible insects (Girl Meets Bug). And even though the idea of eating insects is 'disgusting' for most Westerners, interest for them is growing quickly (Van Huis et al., 2013).

A final remark and a link to Chapter 2, is the fact that in Western food culture, sarcophagy is more prominent than zoophagy. In other words; people do not want to recognise the dead animal they have on their plate. Making insects 'unrecognisable' by for instance processing them into flour, can help to overcome the barrier of even trying to eat them.

4.4 Conclusion

In this chapter, I intended to find out how insects can become a part of Western food cultures. In Chapter 3, it appeared that the feelings of disgust towards insects and other invertebrates had a lot of aspects. In this Chapter, we found out that disgust and neophobia, the fear of trying novel foods, are highly correlated. In order to overcome the disgust on insects, it is good to first find out how neophobic people are towards edible insects. This can be measured by the Food Neophobia Scale and will help to create an idea of who is more likely to accept insects as a food and under which circumstances.

Researches have tried to define these circumstances. Positive, indirect information about a novel food has proven to be beneficial for the level of neophobia, unless there was a general idea of disgust towards this novel foods. Direct information, from own experience, may have a positive effect. People tend to

generalize their experience. Especially older children have been proven to do so. Bad tasting novel foods appeared to not have any effect on their willingness to try other novel foods, whereas for younger children, novel foods – good and bad tasting - decreased the willingness to try other novel foods. Also, adults have been proven to be less neophobic. Age appears to also be a determining factor in neophobia and acceptance of novel foods. In the literature, I found some contrasting information; Barréna and Sanchez said that especially older people are less neophobic and Kellert said that especially younger people are less neophobic.

Also, social influence appeared to have a significant influence on the acceptance and liking of new foods. People tend to follow a role model, that may be anyone; a parent or a celebrity for instance. Research pointed out that children are more likely to eat new foods when they saw their mother eating it. When role models are enthusiastic about the novel foods, people are also more likely to accept them. Novel foods of animal origin are more subject to scrutiny and neophobia than novel foods of non-animal origin.

Since the globalisation took a spurt and many foreign people came to Western countries, they brought their food cultures with them. Slowly, novel foreign foods integrated in Western food cultures. As a result of this, the Dutch food culture for instance, also contains pasta and rice – which it never did before. So, it can be said that Western food cultures do not only influence foreign food cultures (see Chapter 3), but these non-Western food cultures also influence how the Westerners eat.

Sushi is one of these examples and in the case study, it became clear that both role models and recognition played a big role in the acceptance. On the one hand, celebrities and other people that were considered to be a role model, promoted sushi by consuming it. On the other hand, sushi became Americanized, adjusted to American wishes and standards, but still, it was sushi. From the examples of sushi and the Lollo Rosso lettuce, we can conclude that role models and 'glocalisation' might be able to play a big role in the acceptance of edible insects in Western food cultures.

Barrena and Sánchez (2013) also proved that recognition of an innovative food was important to increase the possibility of acceptance. Other factors that played a role in accepting novel foods were taste, the nature of the food – whether it would be of animal origin or not – and some socio-demographic factors. These socio-demographic factors were age; younger people were more likely to try and accept novel foods and residence; urban citizens were more likely to accept novel foods than rural citizens. People were also more likely to try a novel food product if; a food was easy to prepare; had a nice appearance; tasted good and was of good nutritional value. A novel food that contributed to a sense of cultural identity and social belonging was also more preferred – Barrena and Sánchez (2013) proved this once again. So was a novel food with clear information on the label. It is striking that Wind and Barrena and Sánchez noticed that older people are less likely to accept novel foods, while other researches point out that the exact opposite is the case. This asks for more research on the relation between age and neophobia to clarify. In order to know which age group is best to target, this needs to be done.

Also, education is a crucial part in increasing the positive attitude towards edible insects, according to amongst others Kellert (1993), Van Huis et al., (2013) and Looy and Wood (2006). Bug-banquets have been proven to be successful, but it has been argued that education must take place on a broader scale; in the classroom, in both traditional as well as online media and through NGO projects.

Finally - using the theory from Chapter 2 – it is known that most Western people feel disgusted about animals that are recognisable on their plate (zoophagy). To eliminate this problem and lower the cultural barrier for eating insects in the Western food cultures, it is possible to take insects and process them into flour which can be used in different products, while remaining 'invisible'.

Although it appears to be difficult to change the attitude on edible insects in Western food cultures; it has been proven that it is possible. However, there needs to be more research done in order to clarify the contradictions found in literature.

5. Discussion

One of the obstacles for this research, was that there was so little information on how food cultures in developing countries are changing. These countries are changing so quickly and – as discussed in this thesis – food cultures and livelihood sustainability are so deeply entwined. This was a shame, not only because it would have provided with more insights on how food cultures function and change, but also because their food cultures have an impact on the earth and environment too. Even though there were little sources to fully support it, the research showed that food cultures are changing, not only Western food cultures, but also the African, the Asian, the Latin American. Western food habits are gaining ground in these regions' food cultures – take for instance the growing demand for meat in Asia or the dispersion of McDonalds' establishments all over the world. Looking at changing Western food cultures only is not sufficient, we must look at these countries' food cultures as well. They make an impact on the world, too.

Also, it is for sure that most people in Western cultures have a strong negative attitude towards insects, but can we really say this is also a food taboo? It has been presented as such in literature (Van Huis, 2013; DeFoliart, 1999), but is this really the case? There is a general feeling of disgust towards insects and entomophagy in Western food cultures. Most people are sceptical about eating insects, but it has never been considered immoral, like eating cow meat is in Hindi food culture, for example. Insects have just never been considered edible, as a result of the multi-faceted feelings of disgust towards them. Because they were never considered to be foodstuff, they were also never prohibited and likewise, it was never considered immoral. So it can be stated that entomophagy is not considered a food taboo in Western food cultures. The general opinion, however, is negative towards it and in that sense, entomophagy shows some similarities. Therefore, the findings by Meyer-Rochow can be used for analysis on how to overcome the cultural barrier for eating insects in Western countries, which has been discussed in Chapter 4.

Another aspect of this thesis, a quite fundamental one, is how theory was used. After reading some of the literature to get started, it seemed as if ideas of food cultures in which entomophagy was practiced and how this relates to the livelihoods of people could be translated to the Western food cultures. Subsequently, this could provide in a well-funded strategy. It appeared not to work like this, at least, not quite. There definitely were some links between the theories discovered in the second chapter and the information in the third chapter. However, it was found that most societies in which entomophagy is still truly practiced, are pastoral, communal. They are way different from the Western societies. Western societies, function in a completely different way and therefore, this information in Chapter 3, can provide a background which helps understand the function and place of different foods in food cultures around the globe, but it appears not to provide a fundamental idea on how to overcome the cultural barrier. This is a fundamental flaw in this research. There are many things that can be done next time to avoid this problem. The most important thing is to focus less on these different cultures and more on the origin and changing of the feeling of disgust and taboos in Western countries. Also, a chapter can be devoted to the

decrease of meat consumption. It is still important to consider that the increase of consumption of insects perhaps does not decrease the amount of meat consumed. In this way, the problem would not be solved! Chapter 3 is useful in some ways – it helps me 'proof' the theories in Chapter 2, and to light another side of it. Also, it helped me to find out more about the ways food cultures take form in everyday life and for this reason, the link with livelihood sustainability is an adequate one.

There were some difficulties in the writing of this thesis in general, also. For instance, it was difficult to find a moment to stop adding information in Chapter 3. When having too little information, there would be nothing plausible to base my arguments and ideas on. For this reason, more and more information was added, leading an overkill on information. Which is not positive, so then, excessive information had to be deleted. This problem came from the fact that the research proposal was quite small. Next time, the research proposal will be given more thought. That way, the thesis itself will have a more firm focus. During the writing process, things fell into place. As for the first and third sub-question, this was not really an issue.

6. General conclusion

Chapter 2 discussed the first sub-question: Why are insects viewed with disgust in Western food cultures? Van Huis et al., (2013) argued that this was in the first place because they were not available. But simply rearing insects in insect farms would not cause Westerners to automatically eat them. It appeared that, a long time ago, the Western food culture developed in such a way that food became industrialized and distantiated from nature. Insects are seen as disgusting, because they are associated with human disease, with crop degradation. Another reason is they look unlike any other living thing and therefore, it is for many people difficult to relate to these animals. Also, it has been discussed that the fear comes especially forth out of lack of knowledge. Food taboos go one step further than just disgust – it is seen as immoral not to adhere to them. There are many taboos attached to religion, although in the West, they are not prominent. The attitude within Western food cultures towards entomophagy is not per se a taboo, but it does have some food taboo-aspects. The reason for food taboos that are relevant for the reason as to why insects are seen as disgusting, were for instance to protect peoples' health. There are initiatives to promote health benefits and knowledge of edible insects – such as the 'bug-banquets' discussed in Chapter 4.

Chapter 3 discussed the second sub-question: How is entomophagy part of different food cultures? In this chapter, it became clear that cultures differ greatly, also in their approach towards entomophagy. For instance, in African food cultures, termites are consumed – over nearly the entire region. However, the termites are prepared differently in different places. This means that we cannot generalise food cultures; in different food cultures, people might eat the same, but they still have their own ways with it. In all the three regions that were discussed in Chapter 3, entomophagy constituted a lot in the daily lives of the people and their livelihoods. This shows that entomophagy and food cultures are not simply something that can be seen as something in a 'vacuum', but entwined in all aspects of life. Although generalisation of culture is not desirable, some similarities in the food cultures in the different regions were found. In all three regions, entomophagy has a very long history and does it contribute positively to the lives of the people. When connecting these findings to the main question, we can already state that food cultures may be difficult to change – they are so fundamental to people's lives, in any way thinkable. Another conclusion that could be drawn was that influences by Western food cultures in general were big – although there was a bit too few literature to support that. The consequences of these influences were amongst others, that Western foods became more popular and traditional dishes (also those with insects) became less popular.

Chapter 3 could be linked to the second chapter. It is proven that the value of insects for the people, determine their attitude towards them. Kellert (1993) discusses that feelings of disgust towards insects decrease in the case of acknowledged positive values, such as aesthetic, ecological or practical. In the food cultures discussed in this chapter, we find that a. the insects that are eaten are highly valued and b. they do contribute in a functional and ecological way to the livelihoods of these people.

Chapter 4 focused on the final sub-question: How can insects be introduced in Western food cultures? This chapter elaborated further on the findings of especially Chapter 2 and discussed how these cultural barriers could be overcome. It appeared that indirect information about the positive (health) benefits and taste of the novel food would decrease the level of neophobia, but in the case of a food that was considered disgusting, this would have no effect. Direct information, however, appeared to be a lot more helpful – experiencing novel foods and having a good experience would generally lower the level of neophobia. Also social influence appeared to be a very powerful tool in promoting novel foods – people tend to follow their role models in their food choices.

Providing information and experience and using social influence in order to overcome the negative attitude towards eating insects were both proposed in literature. Education by the means of 'bug-banquets' and providing information through formal, informal and non-formal channels was seen as a viable means to introduce entomophagy to the big western audience. For instance, by providing classes in school and broadcasting documentaries or television shows that discuss and show entomophagy. Exerting social influence on the Western audience appeared to be a successful strategy as well. By involving Michelin-star restaurants and famous people, eating insects will increasingly be seen as something 'chic', 'high-end' and 'innovative'. It would not be the first time this would have worked – it worked for the Lollo Rosso and for sushi. Also, making sure that insects are not recognisable, can help. As discussed in Chapter 2, people feel disgusted by zoophagy; i.e. they dislike the idea of recognisable animals on their plate. This problem can be solved by processing the edible insects in flour.

So, getting back on my research question: How can insights on the role of entomophagy in different food cultures around the world be used to overcome the barrier in Western food cultures? As mentioned in the discussion, this might not have been the ideal approach, but it helped to reach some fruitful conclusions. First, it can be concluded that it will be quite difficult to convince the Westerners to eat insects – overcoming the cultural barrier will be a challenge. As could be seen from all food cultures in which entomophagy was practiced, it was accompanied by a long history of tradition. It will take time, the ideas and feelings about insects and entomophagy – in both the Western food cultures and those discussed in Chapter 3 - have been conditioned in the society since time immemorial and they cannot be changed overnight. Therefore, a greater challenge will be to make edible insects part of the food cultures as they have become in Latin America, Asia and Africa. But, it has to be said that the prospects look promising – in general, people respond well to information about insects and entomophagy and attention for sustainability in the general public is definitely growing.

Personal Reflection

I could never foresee that I would come to Wageningen and become so interested in the world food problem. It fascinates me, mainly because it has so many aspects; agricultural, social, economic, psychological, to name but a few. Even though the topic is so controversial, no one can disagree that something has to be done about it, as it affects everyone of us. I hope that one day, I can contribute to the solution – as little as my contribution might be. At least, I am really glad that I had the opportunity to write about this topic; I learned so much. I read numerous articles from various disciplines, learned about many things that I never even heard about before.

There were several things that I intended to learn, writing this thesis. I wanted to learn more about the relation between food and culture. I have always been quite culturally oriented and I love food - any aspect of it (but mainly the eating, I am afraid). The conclusion that I could draw for this, was that it is difficult to say food and culture are related – no, they are pretty much the same thing. Food is a binding factor in society, it thus defines culture. What we eat is defined by where we live, what we do, who we are, where we are from, what religion we have… I can go on for quite a while, but I suppose I made my point.

I learned more than whatever I found in my sources, I have to say that. I was very uncertain about myself in the beginning of the thesis, feeling anxious to start writing. The more anxious I felt, the worse the writing went and that became a vicious circle. On top of that, I was sick quite often in the beginning of the sixth period – all this made me decide to postpone my deadline. I felt horrible about doing so, since I am always the perfectionist who wants to do everything according to the book. But, taking some time to calmly heal and start up my writing actually made me gain time. This sounds contradictory, but I lost more time stressing in the first three weeks, than I did working quietly while having lots of fun writing. It made me remember one of the things one of my friends once told me: "*The most time-consuming thing you can do, is to rush your work*". And now I learned he was right.

But most of all, I wanted to learn how to write a big, scientific work. It might only just be a bachelor's thesis, but for me, it feels like quite an accomplishment to have written this piece. I do not know what the judgement of my both my supervisor and second reader will be, but at least, I can say I wrote it! I do hope to be able to get a good grade for this thesis, so I can continue with the Research Master International Development. Then, I can really become experienced and acquainted with scientific writing and most of all, learn more about the world around me and contribute to it for the better.

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Appendix - recipes

Recipe: Gluten-Free Chocolate Chirp Cookies (Recipe by Little Herds!)

Ingredients:
95 grams all-purpose gluten-free flour
95 grams 100% pure cricket flour
60 grams coconut flour
1 teaspoon baking soda
½ teaspoon salt
2 large eggs
230 grams butter, softened but not melted
150 grams sugar
150 grams brown sugar
2 teaspoons Madagascar vanilla
1 cup chopped crickets, walnuts or pecans (crickets obviously preferred), optional
300 grams 60% cocoa chocolate chips

Preparation

1. Preheat oven to 180º Celsius. Combine gluten-free flour, cricket powder, coconut flour, baking soda and ½ teaspoon salt; stir and set aside. In a separate bowl, beat eggs until blended and set aside.
2. In a large mixing bowl, beat butter with sugar and brown sugar at medium speed until creamy and lightened in colour. Add eggs and vanilla. Mix on low speed until incorporated. Blend flour mixture into creamed mixture in parts, making sure all the dry flour is moistened. Stir in nuts chocolate chips and crickets.
3. Chill the dough for a few hours, or, for the best texture, overnight.
4. Form into small balls and put them a little aside from each other on baking paper. If desired, sprinkle some sea salt on each ball of dough.
5. Bake until golden brown, 8 – 10 minutes. Cool on a rack.

www.littleherds.org

Recipe: Tuile cookies – recipe by Pierre Wind

Ingredients:

One box of mealworms

375 grams powdered sugar

375 grams egg white

225 grams all-purpose flour

125 grams molten butter

A teaspoon rosemary and thyme

Freshly, fine cut mint leaves

Preparation:

1. Preheat the oven at 180º Celsius.
2. Mix the molten butter with the flour. Add the egg whites with the sugar and stir well.
3. Add the mealworms, rosemary, thyme and mint leaves.
4. Put the dough on baking paper, keep the cookies at least 3 centimeters away from each other.
5. Bake them until they are golden brown, when you get them out of the oven, they are still a bit flexible, they will harden in a minute.