Quantitative Consumer Study on the Preference to Intrinsic Quality Attributes of Dried Mango among Dutch Consumers

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Quantitative Consumer Study on the Preference to Intrinsic Quality Attributes of Dried Mango among Dutch Consumers

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**Terminology**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>ACBC</td>
<td>Adaptive Choice-Based Conjoint</td>
</tr>
<tr>
<td>Attribute</td>
<td>Single perceptible impression of a characteristic feature, e.g. red for colour, sweet for taste, firmness for consistency (Definition used in sensory science course, 2013).</td>
</tr>
<tr>
<td>Barriers</td>
<td>The driving force within individuals that discourage them to take action (Schiffman &amp; Kanuk, 2000).</td>
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<td>DM</td>
<td>Dried mango</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus group discussion</td>
</tr>
<tr>
<td>Motives</td>
<td>The driving force within individuals that encourage them to take action (Schiffman &amp; Kanuk, 2000).</td>
</tr>
<tr>
<td>Perception</td>
<td>The way in which something is regarded, understood, or interpreted (Oxford Dictionary, 2017).</td>
</tr>
<tr>
<td>Preference</td>
<td>The fact that you like something or someone more than another thing (Cambridge Dictionary, 2017).</td>
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Abstract

In recent years, healthy eating has more important to Europeans (Jesionkowska, Sijtsema, Simoneaux, Konopacka, & Plocharski, 2008). The demand of fruit and vegetables is therefore increasing in Europe. Drying of mango is one of the common way to process mango in the world and dried mango is a convenient food product for consumers who want to eat (more) fruit.

In a previous study, dried mango was perceived as a luxury product and healthier snack than other snacks (e.g. cookie, chocolate bar, etc.) by Dutch consumers (van Oirschot, 2016). It was also found that Dutch consumers have a limited familiarity towards (dried) tropical fruit in general. This gives a great opportunity to launch dried mango in Dutch market. It is therefore necessary to understand the preferences of Dutch consumers towards the intrinsic quality characteristics of dried mango, focusing on its sensory and health attributes.

For this study, a quantitative consumer research was conducted in order to understand the preferences of the intrinsic quality attributes of dried mango. Six intrinsic quality attributes (extra ingredients, sweetener, texture, dominant taste, dominant texture, fresh mango flavour and colour) of DM were evaluated by 125 Dutch respondents and it was analysed using the conjoint analysis (ACBC) (Sawtooth Software, 2017).

As the conclusion of this research, the most important intrinsic aspect of dried mango for consumption decision was the additives that were mentioned in the survey. Dried mango with additives was the main barrier for Dutch consumers in consuming the product. However, it was also found that the elderly group of consumers would accept the natural sweetener (with less calories) since it was perceived as well as the most important attribute by this group. Another finding, the crispy texture seemed to be undesirable and possible for health reasoning. It would give less healthy feeling when the product does not contain a moist texture (juiciness) based on the resemblance of fresh fruit (van Oirschot, 2016). Furthermore, the respondents who tend to sacrifice more for health were more positive in evaluating the characteristics of dried mango. They would perceive DM as healthy snack (Sijtsema, Jesionkowska, Symoneaux, Konopacka, & Snoek, 2011). So, consumers who are more health conscious would be better target group for dried mango. Overall conclusion was that Dutch consumers perceived the health-related intrinsic quality more important than the sensory-related intrinsic quality attributes of dried mango. Hence, the desired product by Dutch consumers could be described as follow: a natural dried mango without any additives and chewy texture. In addition, the following attributes were undesired: more sour than sweet, weaker flavour as fresh mango, and darker colour than pale orange.
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Chapter 1 - Introduction to Research

1.1 Research background

After the recession period in 2010-2012 the availability of fresh and DM in Europe has been increasing. Between 2012 and 2013 the European imports of dried mango increased by 10% (from 2 000 to 2 200 tons). This trend is expected to continue since the demand of fresh and processed fruits and vegetables is still increasing (Sabbe, Verbeke, & Van Damme, 2015). More Western Europeans became health conscious in recent years. The health factor when making a food choice is getting more important for them. However, their fruit consumption is lower than the recommended level (WHO, 2013). Even though knowing the benefits of fruit consumption, such as preventing cardiovascular disease and weight gain, they find it inconvenient to prepare and store the fresh fruit (CBId, 2008; CBic, 2017). It would therefore important to develop a convenient dried fruit to snack that is appealing to Dutch consumers, in order to contribute their fruit consumption. DM seems to have promising (export) market in the Netherlands (CBIe, 2014). In the Netherlands there are large processors for dried fruit and nuts, and for cereals.

There is little information available concerning consumers’ perception and preference towards DM. In a previous qualitative exploratory study, researchers found that consumers, including Dutch consumers, perceive dried fruit as healthier snack compared to regular snacks (Sijtsema, Jesionkowska, Symoneaux, Konopacka, & Snoek, 2011). They are well informed that dried fruits still contain important (micro)nutrients after the traditional drying process. Dried fruit is a valuable source of energy, dietary fibre, minerals and anti-oxidants. These nutrients are also clearly stated on the packaging of dried fruit in the market. However, Dutch consumers also considered dried fruit to be unhealthy because of their large sugar content and a loss of vitamins due to drying. In addition, another qualitative study concluded that sensory factor is also a significant in choosing DM to consume among the Dutch consumers (van Oirschot, 2016).

So, these perceptions of intrinsic quality of DM are very complex. A further exploration, with quantitative research, on the preferences of DM was recommended by the previous researchers. This is needed in order to accomplish the first stage of the new product development of DM.

This study is a part of a cross-national study with another two different nationalities, which are the Chinese and Indonesian consumers. These groups of consumers have different availability and familiarity of DM according to the previous qualitative study. Indonesia is a tropical country with high availability and high familiarity of DM. China is a sub-tropical country with high availability and low familiarity of DM. In contrast, the Netherlands is a non-tropical country with low availability and low familiarity of DM. Comparing these different consumer groups would be therefore interesting and this way, the results were expected to provide additional insights for the first stage of new product development of DM.
1.2 Research objectives

*To obtain insight of the consumer preferences toward intrinsic quality attributes of DM among Dutch consumers, in order to provide information for the first stage of new product development of DM in the Netherlands.*

1.3 Research questions

**Research question:**
What are the preferences to intrinsic quality attributes of DM among Dutch consumers?

The specific questions that will answer the above research question are as following:

- **Sub research question 1:**
  What is the profile (importance) of intrinsic quality attributes of DM that is most preferred by the consumers?

- **Sub research question 2:**
  What is the consumer’s preferences (level of attributes) of intrinsic quality attributes of DM?

- **Sub research question 3:**
  What is the profile and preferences of intrinsic quality attributes between the consumers with different health orientation?

1.4 Scope

As it was mentioned before, DM is chosen to be the main focus in this study because DM seems to have a promising market in the Netherlands (CBl, 2014). There are two types of DM in the market: DM for direct consumption and DM as an ingredient. The latter is more known to Dutch consumers. Dutch consumers who purchase DM in supermarkets, use the product as a healthy and tasty additional ingredient to a product (e.g. bowl of yoghurt or cookie) (AH, 2017; Jumbo, 2017). In China and Indonesia, the DM is usually eaten directly as a snack, and rarely as an ingredient to a product (Amanda, 2016; Zhang, 2016). In this study, the focus was only “DM for direct consumption”, so that it made possible to do the cross-national study accurately.

Another focus is the intrinsic quality attributes (health and sensory), whilst excluding the extrinsic quality attributes (e.g. packaging, convenience). In preceding study of this research (van Oirschot, 2016), it was found that health and sensory motives and barriers were significant in the food choice of dried fruit or DM among Chinese, Indonesian and Dutch consumers. Moreover, not much is known about the preference of health and sensory factors toward DM. Conducting a quantitative analysis on these two factors can therefore provide a generalization of the most important and preferred intrinsic quality attributes for Dutch consumers.
1.5 Research approach

Within a period of six months this research was performed in the following stages:

1. Conducting a literature research

In order to get more understanding and clarity of the topic the literature research was initially conducted. In this stage, the general background about tropical and dried fruit in Europe and the Netherlands was covered. Furthermore, the consumer perception and preferences of DM among European and Dutch consumers from previous literatures were studied. From these literatures the intrinsic quality attributes of DM were determined. Lastly, the principle and methods of conjoint analysis were studied in order to choose the most fitted conjoint analysis method for this research.

2. Selecting a conjoint analysis method

As a part of the methodology for this research, different conjoint methods were discussed and the most fitted conjoint method (ACBC) was chosen.

3. Designing, testing and distributing the conjoint survey

Next step of the methodology is formulating the questions for the conjoint survey and publishing them with the Sawtooth Software. After the back-translate of the questions from Dutch to English and conducting the pilot test to numerous respondents, the conjoint survey was ready to distribute.

4. Screening and analysing the data

To have more reliable conclusion, the data from all respondent was initially screened and selected according to a certain criterion (discussed in chapter 3). Then, the selected data was analysed using the Sawtooth Software and the program SPSS. Based on this analysis the sub-questions and subsequently the overall research question is answered.

1.6 Structure of the report

Chapter 2 reviews the outcome of the literature research related to DM and its perception and preferences by European consumers, and related to the conjoint analysis methods. Chapter 3 outlines the materials and methods that were implemented in order to answer the research questions. Chapter 4 outlines and discuss the results from the conjoint survey. Chapter 5 concludes the answers to the research questions. Chapter 6 discusses some recommendations for future researches.
Chapter 2 – Literature review

First part reviews the current situation of tropical and dried fruit in Europe, including the Netherlands. Second part explains the frameworks that were used in this research. Third part outlines the different conjoint methods.

2.1 Tropical Fruit and Dried Fruit in Europe

2.1.1. Tropical Fruit in Europe

Mostly located in a non-tropical region, the demand for tropical fruit in Europe is also high making the European Community the world’s largest import market of tropical fruit (FAO, 2016). In Europe, tropical fruit is still considered as a niche product especially the exotic tropical fruit (CBIa, 2016). The import of exotic tropical fruits (e.g. passion fruit, lychee, starfruit, jackfruit, fresh tamarind) in Europe reached over 35 thousand tonnes in 2015 (CBlb, 2015). The Netherlands and Belgium have served as European trade hub responsible for 80% of total import of fruits (CBlb, 2016). Within the past five years, the Netherlands has played a significant role as the re-exporter of fruits with Germany and France as its main destination (CBlb, 2016). Among the tropical fruits, mango has exhibited an upward trend for the European market since 2012 (CBlb, 2016). European countries import mango mostly from developing countries (CBlb, 2008). By 2015, the import of mangoes to Europe had grown to 81% reaching 279 thousand tonnes. Again, the Netherlands was responsible for 55% of Europe’s mango import and served as the trade hub for mango in Europe (CBlb, 2016). Around 43% of the mangoes imported to the Netherlands is re-exported to Germany (CBlb, 2016). These findings imply that mango is highly demanded in Europe generally and in the Netherlands specifically, compared to other tropical fruits.

2.1.2. Dried Fruit and DM in Europe

In Europe, dried fruit consumption reached 871 thousand tonnes in 2006 (CBlb, 2008). The biggest market segment for dried fruit in Europe is the food processing industry. Depending on the countries, dried fruit is commonly consumed as a fruit snack, or used as the ingredient in other food products like breakfast cereal, confectionary product, bakery, and dessert. In Netherlands, people are more familiar to consume dried fruit product (e.g. breakfast cereal) than the dried fruit itself (CBI Market Survey, 2008). The previous qualitative study by van Oirschot (2016) found out that the Dutch are more familiar with non-tropical dried fruit e.g. raisins and have limited familiarity to dried tropical fruit.

However, as mango is highly demanded in Europe, the data showed that current mango consumers in Europe are looking for a more convenient way to enjoy mango as healthy snack (CBlb, 2016). This opens an opportunity to develop a healthy product of mango e.g. dried mango. Moreover, for Dutch consumers, dried mango was also found to be more special if compared to non-tropical dried fruit (van Oirschot, 2016). The European dried mango import reached 3,400 tonnes in 2005 (CBlb, 2014).
2.2 Consumer Perception of Dried Mango

The path from the fundamentals of consumer-driven food product development to understanding the consumers’ perception of a food product will be reviewed in this part.

2.2.1 Consumer-driven Food Product Development

In order to make a new food product successful in the market, developers need to create a product that is based on consumers’ needs and wishes. This approach is also called the Consumer-driven Food Product Development (Linnemann, Benner, Verkerk, & van Boekel, 2005). It is to satisfy the growing numbers of consumers with desired food quality and to minimize waste in food supply systems. Thus, the main focus of consumer-driven food product development is the consumer. The consumer is the one who decides to purchase the product and whether to re-purchase same product and/or recommend the product to others. Conducting a consumer research will be therefore a good investment for higher chance of success when launching the product in the market. It is also inexpensive research compared to the risk of product failure (van Kleef, van Trijp, & Luning, 2004). Therefore, spending the time and money on a consumer research for NPD will be a good investment to lower the risk of product failure.

Consumer research can be conducted in various stages of NPD process (van Kleef, van Trijp, & Luning, 2004). In this article, van Kleef et al. (2004) depicted an outline of four basic stages of NPD process (see figure 2.1). Description of these stages in short is as follow:

1. **Opportunity identification**: the search of an opening in the market (understanding consumer needs and wishes) and generating ideas for a new product concept.
2. **Development**: translating the consumer needs and wishes into product requirements (Linnemann, Benner, Verkerk, & van Boekel, 2005).
3. **Optimization**: testing and optimizing the product before launching.
4. **Launch**: introducing the product to the market.

![Figure 2.1 Stages of new product development process](image)

Although consumer research can be conducted in every stage of NPD, it is known that it is higher chance of success if the consumer research is applied in the early stage(s) (Linnemann, Benner, Verkerk, & van Boekel, 2005). Two out of three new food product do not survive the second year in the market. The number of failure is even higher for the ones that never make it through the first stage(s) of the NPD process (Linnemann, Benner, Verkerk, & van Boekel, 2005). Therefore, following every stages of NPD process leads higher chance of product success.
This study is at the stage of ‘understanding the consumer needs ’, which is indicated as grey coloured block in figure 2.1. The previous study, by Oirschot (2016), conducted the focus group discussion (qualitative research) in order to understand the perception of Dutch consumers. A promising quantitative research method applied to this stage is the conjoint analysis which will be discussed in this chapter, section 2.3.

2.2.2 Total Food Quality Model

In order to analyse consumers’ perception towards the food quality and their food choice, the Total Food Quality Model (TFQM, figure 2.2) was proposed by researcher Grunert et al (2002). This integrative framework maps the process of the consumer’s mind before and after purchase. It integrates different perspectives to the perception of food quality, which are the means-end chain theory (Gutman, 1982), the multi-attribute attitude theory (Ajzen & Fishbein, 1975), and the economics of information approaches (Darby & Karni, 1973). Moreover, this hierarchical model explains the consumers’ satisfaction by comparing the expected quality with the experienced quality. The expected quality is formed by intrinsic and extrinsic quality cues that the consumer received ‘before purchase’, which is displayed on the left-side of the TFQM. The consumer will have an experienced quality ‘after purchase’ shown on the right-side of the model. It is commonly the case that the experienced quality is not what the consumer is expected and this will determine the consumer satisfaction and the probability of re-purchasing the product (Brunsø, Fjord, & Grunert, 2002).

As it was mentioned before, this research is the continuation of the qualitative study by Van Oirschot (2016). Van Oirschot adjusted the TFQM in order to be able to analyse the acquired data from the focus group discussion. See figure 2.3 for this adjusted TFQM. Three aspects from the original TFQM was omitted: (1) ‘technical product specifications’, (2) ‘cost cues’ and (3) ‘sensory characteristics’ of the product after purchase. These aspects were not included in the research, and therefore not relevant to be applied in the analysis of the research. There were also changes of wording. The term ‘consumption’ is applied instead of ‘purchase’ since the research is emphasis on the intrinsic attributes of the product, namely sensory and health attributes.
attributes, which were the most important motives for food choice among Dutch consumers. Furthermore, the expected quality was defined as ‘motives and barriers’ because it leads to the mind of “whether the expected consumption motive is fulfilled” and as subsequently leading to intention to buy the product. This description is parallel with the definition of motives and barriers in this study. A motive (for consumption) is defined as: ‘The driving force behind behaviour which gives direction and intensity to behaviour of consumption’ (Meiselman, 1996). The definition of a barrier is in contrary, ‘the driving force discourages the consumer to take action.’ So, motives and barriers compose of attributes that are evaluated by the consumers. Their decision to consume the product is based on their preference towards the attributes. For example, a product that is perceived ‘too sweet’ is a barrier to consume the product for the consumer.

![Figure 2.3: Adjusted TFQM for this study focusing on intrinsic quality](image)

The attributes that were analysed in this research were determined from the motives and barriers analysed by Van Oirschot. Therefore, the adjusted TFQM was also applied in this research. However, the focus is on the health- and sensory motives and barriers before the consumption, see the red circled box in figure 2.3. These quality attributes were mentioned more frequent by the participants than the convenience attributes during the focus group discussion (FGD). Moreover, health and sensory attributes seemed to have large impact on the purchase decision of the dried tropical fruit (DTF) and DM.

2.2.3 Consumer perception towards dried tropical fruit among Dutch consumers

Van Oirschot conducted the FGD in order to determine the motives and barriers of consuming DTF and specifically DM. There were 15 participants in FGD, mainly women (67 %), age between 20-40 years as a criterion of the targeted group. Other criteria were: fluent in Dutch, consumed dried fruits at least once a year, do the grocery shopping themselves, highly educated, do not know each other and unaware of the research objectives. The motives and barriers were categorized to health, sensory and convenience. The convenience motives and barriers were excluded in this research because they were less an issue to the Dutch consumers than the health and the sensory motives and barriers.
Health-related motives and barriers

Overall conclusion regarding the health attributes is that the dried tropical fruit (emphasising dried banana, pineapple, papaya and coconut) and DM was considered to be healthy compared to other regular snacks (e.g. candies, chocolate, chips, etc.). Table 2.1 overviewed the health motives and barriers of dried fruit and DM mentioned by the participants.

Table 2.1 Motives and barriers of health attributes, determined by focus group discussion (n=15) (van Oirschot, 2016). In dried fruit (emphasising dried banana, pineapple, papaya and coconut) and DM. DTF (dried tropical fruit).

<table>
<thead>
<tr>
<th>Health</th>
<th>Motives</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional content</td>
<td>Nutrients (Fibre, vitamins, minerals, antioxidants); Sugar (weight gain); Less calories, more healthy (compared to other snacks).</td>
<td>Less nutrients (vitamins); High sugar content; High fat content.</td>
</tr>
<tr>
<td>Natural content</td>
<td>No additives</td>
<td>Additives (colourants)</td>
</tr>
<tr>
<td>other</td>
<td>Quality DTF more reliable than fresh fruit.</td>
<td>Cannot oversee what happened to DTF; No moisture, less healthy feeling; Problems with intestines and bowel movement.</td>
</tr>
</tbody>
</table>

Sensory-related motives and barriers

Van Oirschot (2016) found out that a sweet taste was an important motive and a hard texture an important barrier for the consumption of the dried tropical fruit. There were several differences in comparing the outcome from dried tropical fruits and DM. One of the important distinction of DM is the combination taste of sweet and sour. Table 2.2 gives an overview of all motives and barriers mentioned in FGD.

Table 2.2 Motives and barriers of sensory attributes determined by focus group discussion (van Oirschot, 2016). The difference is indicated with (DM).

<table>
<thead>
<tr>
<th>Sensory</th>
<th>Motives</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavour (taste)</td>
<td>Sweet; Resembles fresh fruit; Fresh; Sour; Does not resemble fresh fruit; Distinct taste (e.g. coconut); Sour/sourish (DM); Sweet and sour (DM); Taste is released while chewing (DM)</td>
<td>Too sweet; Does not resemble fresh fruit; Stale; Bitter aftertaste (DM).</td>
</tr>
<tr>
<td>Flavour (smell)</td>
<td>Fresh and fruity odour.</td>
<td></td>
</tr>
<tr>
<td>Texture</td>
<td>Soft (pineapple, papaya); Hard (banana);</td>
<td>Hard (banana, DM);</td>
</tr>
</tbody>
</table>
2.2.4 Health orientation of consumers

An article discussed the health consciousness of the consumers was reputed to have different perceptions towards an organic food (Schifferstein & Oude Ophuis, 1998). It was analysed with 11 health statements on a 5-point Likert-scale for consumers to evaluate, resulting two types of health orientations: health sacrifice and health preoccupation. These health statements listed as follow (Schifferstein & Oude Ophuis, 1998; Sijtsema, Jesionkowska, Symoneaux, Konopacka, & Snoek, 2011):

1. I have the impression that I sacrifice a lot for my health;
2. I consider myself to be very health conscious;
3. I am prepared to leave a lot, to eat as healthy as possible;
4. I think I take health into account a lot in my life;
5. I think it is more important to know how to eat in a more healthy way;
6. My health is so valuable to me that I am prepared to sacrifice many things for it;
7. I have the impression that the other people pay more attention to health than I do;
8. I do not continually ask myself whether something is good for me;
9. I do not often think about whether everything I do is healthy;
10. I do not want to ask myself all the time whether the things I eat are good for me;
11. I often dwell on my health.

Another dried fruit study using this method had concluded: “the more the respondents reported a willingness to sacrifice for their health, the more positive they were about the health aspects of both fresh and dried fruits” (Sijtsema, Jesionkowska, Symoneaux, Konopacka, & Snoek, 2011). In contrary with health preoccupation people, they seem to be more critical about health aspects.

Also, in this study the health orientation was considered to obtain more insights of the consumer characteristics. Ultimately, to find out the relevant target group of DM.

2.3 Preference

Consumers made their purchase or consumption decision based on their preferences. Preference is defined as ‘a greater liking for one alternative over another or others.’ Many factors (attributes of a food product) combine influence the consumer preference (Amerine, Pangborn, & Roessler, 1965). For example, it was experimented that removing colour discrimination, using special tinted goggles, slowed the shopper and altered the food choice among U.S. consumers. Another experiment concluded a high number of U.S. consumers mentioned that flavour is the reason for overall preference and re-consumption of a food product (Amerine, Pangborn, & Roessler, 1965).
Different products have different quality cues and attributes, and different persons will have different quality perceptions (orientations, contextual and situational factors) (Oude Ophuis & van Trijp, 1995). It is therefore important to identify consumer’s importance towards quality attributes and its relations with physical product parameters (level of attributes).

A common used quantitative tool in academic and industry to analyse consumers’ preferences of a multi-attributed product is conjoint analysis (Green & Srinivasan, 1990; Orme, 2009). The following section will review this technique.

2.4 Conjoint analysis

Conjoint analysis is a product-driven method whereas the products are represented by their attributes, and the respondents are asked to select their preferred level of attribute and how much they value the attributes (van Kleef, van Trijp, & Luning, 2004). Typically studies use between two and five levels for each attribute (van Kleef, van Trijp, & Luning, 2004). The purpose of conjoint analysis is to predict consumers’ reactions to a new product by estimating the structure of a consumer’s preferences (Green & Srinivasan, 1990).

Frez Munoz (2015) conducted similar quantitative study using conjoint analysis but subjected to the canned whole peeled tomatoes (Frez Munoz, 2015). It was discussed in Munoz’s methodology that Adaptive Choice-Based Conjoint (ACBC) was the most fitted conjoint method to allow to investigate a large number of attributes and levels without considering a large sample size.

ACBC analysis method was developed by the organization of Sawtooth Software (Orme, 2009). There are three stages in order to be able to conduct the ACBC analysis using Sawtooth Software (Frez Munoz, 2015). Figure 2.4 depicts these stages in the flow scheme and the following is a short description for each stage:

1. Build your own (BYO)
First stage is to allow the respondent to make selections of preferred level per product attribute. This way the software will recognize the product concept closest to respondent’s preferences.

2. Screening
At second stage, based on the BYO task the software develops a set of “near-neighbour” product concepts to be evaluated by the respondent. Respondents will be asked to indicate which level of attribute is a necessity (must-have) or avoided (unacceptable) (Orme, 2009). This purpose of this stage is to test respondent’s sensitivity to changes to their BYO product concept.

3. Choice Tasks
Third stage is the selection of the best option of the product from the consideration set. The choice tasks will generate different options numerous times, depending on the number of attributes.
Figure 2.4 Flow scheme of ACBC analysis using Sawtooth Software (Orme, 2009).
Chapter 3 – Materials and Methods

The quantitative analysis on the preferences towards DM was done by the conjoint analysis, the ACBC method, using the Sawtooth Software. In this chapter, the methodology will be described in four sections. First, the selection of attributes and levels of attributes. Second, the formulation of the survey questions using Sawtooth Software. Third, the distribution of the surveys. Fourth, the analysis of the data from the respondents.

3.1 Attributes and levels of attributes

A high number of health and sensory attributes were mentioned during the FGD (table 3.1 in appendix A). The more attributes, the more choice-tasks during the survey. Reducing the number of attributes would minimize the chance of designing a tedious survey for the respondents. This was done by a discussion with the team in deciding which intrinsic quality attributes had the most influenced on the motives and barriers, also among Chinese and Indonesian consumers. The attributes had to be relevant and constant to all three consumer groups in order to be able to make the comparison. Also, for the levels of attributes were determined this way. The selected attributes and levels of attributes were included in the BYO part (part 3) of the conjoint survey. Table 3.2 listed the attributes and levels of attributes used for the conjoint analysis.

3.2 Design of the conjoint survey

The survey questions for the conjoint analysis were formulated and published using the Sawtooth Software. The published survey (Dutch version) can be found in appendix B. Here follows the description per section of the survey.

Introduction: The conjoint survey starts with an introduction in order to explain the research aim to the respondent with a picture of fresh mango that can be found in the Dutch supermarket (e.g. Albert Heijn and Jumbo).

Part 1: Conditional question and demographic
In order to aim the target group (discussed in section 3.3), the first question was conditional in which disqualified those participants who were not part of the target group. Followed by demographic questions. The possible answers were per question were:

- What is your nationality?
  - Dutch
  - Others

- In which city are you living now? (open question)

- What is your age? (open question)

- What is your gender?
  - Male
• Female

• What is your highest education diploma? (in Dutch education system)
  o Primary education or lower (basisschool)
  o Middle school (LBO, MAVO or VMBO)
  o High school (MBO or HAVO/VWO)
  o College/bachelor degree (HBO or Bachelor)
  o Master degree or higher (Master or higher)

Part 2: Experiences
The familiarity of DM can influence the answers in the conjoint part of the survey. Therefore, it is necessary to understand the experiences of the respondents towards fresh mango and DM. The questions and possible answers related to the experiences were as follow:

• Have you ever eaten fresh mango?
  o Yes
  o No

• Have you ever eaten dried mango as a single product*?
  o Yes
  o No

* eating as a single product means you eat dried mango solely, not as a part in another product, e.g. snack bar with dried mango topping

• How often do you eat dried mango?
  o Daily
  o Weekly
  o Monthly
  o Few times a year
  o Never
Part 3: BYO
Six intrinsic quality attributes of DM were selected, along with 3 or 4 preferred levels per attribute. The respondent was asked to select the best option or nearest option to your preference for each characteristic of DM. Table 3.2 shows these characteristics and the options per characteristic.

Table 3.2 An overview of the options for respondent to select in the core part (BYO-part) of the survey.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Level of attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mango Flavor</td>
<td>• Weaker flavor than fresh mango</td>
</tr>
<tr>
<td></td>
<td>• Similar flavor as fresh mango</td>
</tr>
<tr>
<td></td>
<td>• Stronger flavor than fresh mango</td>
</tr>
<tr>
<td>Dominant Taste</td>
<td>• More sweet than sour</td>
</tr>
<tr>
<td></td>
<td>• Balanced sweet and sour</td>
</tr>
<tr>
<td></td>
<td>• More sour than sweet</td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>Dominant Texture</td>
<td>• Chewy (e.g. raisins)</td>
</tr>
<tr>
<td></td>
<td>• Soft (e.g. banana)</td>
</tr>
<tr>
<td></td>
<td>• Crispy (e.g. Lay’s chips)</td>
</tr>
<tr>
<td>Sweetener</td>
<td>• Sugar/honey, high calories</td>
</tr>
<tr>
<td></td>
<td>• Low calorie, natural sweetener (e.g. fruit sugar)</td>
</tr>
<tr>
<td></td>
<td>• No calorie, artificial sweetener (e.g. saccharine)</td>
</tr>
<tr>
<td>Extra Ingredient</td>
<td>• Salt</td>
</tr>
<tr>
<td></td>
<td>• Spices (e.g. chili, ginger)</td>
</tr>
<tr>
<td></td>
<td>• Combination of salt and spices</td>
</tr>
<tr>
<td></td>
<td>• No extra ingredient</td>
</tr>
</tbody>
</table>

Part 4: Screening
For this part and part 5 the system of the conjoint survey was programmed in tested settings as shown in table 3.3. These settings were tested by 5 virtual respondents (using the Sawtooth Software) in order to evaluate whether these settings can have sufficient data to analyse.
Table 3.3 Settings for screening tasks and choice tasks in the Sawtooth Software.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of attributes</td>
<td>6</td>
</tr>
<tr>
<td>Build your own tasks (BYO) included</td>
<td></td>
</tr>
<tr>
<td><strong>Screening Tasks</strong></td>
<td></td>
</tr>
<tr>
<td>Number of Screening tasks</td>
<td>5</td>
</tr>
<tr>
<td>Number of concepts per Screening task</td>
<td>4</td>
</tr>
<tr>
<td>Minimum number of attributes to vary from BYO selections</td>
<td>2</td>
</tr>
<tr>
<td>Maximum number of attributes to vary from BYO selections</td>
<td>3</td>
</tr>
<tr>
<td>Number of unacceptable questions</td>
<td>2</td>
</tr>
<tr>
<td>Number of must have questions</td>
<td>1</td>
</tr>
<tr>
<td>BYO Product Modification Strategy</td>
<td>Mixed</td>
</tr>
<tr>
<td><strong>Choice Tasks Tournament</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum number of concepts included in choice tournament</td>
<td>14</td>
</tr>
<tr>
<td>Number of concepts per choice task</td>
<td>3</td>
</tr>
<tr>
<td>Calibration concept</td>
<td>0</td>
</tr>
</tbody>
</table>

- Avoiding Dominated Concept is not used
- Include BYO in tournament is not used

Based on the selections in the previous part (BYO-part) the system will automatically generate the consideration sets. These sets were the near-neighbour product concepts. The respondent was asked to evaluate every set, whether the product concept is acceptable or unacceptable. This way the required and avoided levels per attribute could be identified. The questions were formulated as follow:

- **FOR ME IT IS UNACCEPTABLE THAT DRIED MANGO HAS...**
  Would any of these features be totally unacceptable to you? If so, *choose the one feature that is most unacceptable to you*, so we can just focus on the characteristics of dried mango that meet your needs.

- **FOR ME DRIED MANGO MUST HAVE...**
  If any of these is an absolute requirement for you, it would be helpful to know. If so, *please choose the one most important characteristic*, so we can just focus on dried mangoes that meet your needs.

**Part 5: Choice tasks**
The system considered the selections that were made during the screening and generated new product options. At every choice task the following question was formulated:

- *Please carefully examine and decide which one among these possible combinations do you prefer?* (I’ve grayed out any features that are the same, so you can just focus on the differences.)
Part 6: Health orientation
In addition, the 11 health statements were presented in order to find out how health conscious the respondent was. The formulation of this part in the survey:

*Please indicate to which extent you agree with each of these statements.*

1. I have the impression that I sacrifice a lot for my health
2. I consider myself to be very health conscious
3. I am prepared to leave a lot, to eat as healthy as possible
4. I think I take health into account a lot in my life
5. I think it is more important to know how to eat in a more healthy way
6. My health is so valuable to me that I am prepared to sacrifice many things for it
7. I have the impression that the other people pay more attention to health than I do
8. I do not continually ask myself whether something is good for me
9. I do not often think about whether everything I do is healthy
10. I do not want to ask myself all the time whether the things I eat are good for me
11. I often dwell on my health

**Award and comment box:** An award (15 euro VVV-coupon) was distributed to 5 participants: 10th, 20th, 30th, 40th and 50th respondent who completed the survey were chosen to receive this award. As a request from one of the respondents (by email) a comment box was added at a half-way of the survey distribution.

**Closing:** Two closing messages were created. One was for the respondents who were disqualified (non-Dutch nationality). Thanking them for the interest of participating this survey. Another message for the respondents who completed the survey. Thanking them for their time and interest, and asking them to send an email to me if they have some comments and questions about the survey and the topic.

3.3 Distribution

Using the Sawtooth Software the surveys were published in the web server owned by the Sawtooth Software company. The survey link was then distributed with an announcement message by e-mails to the target group. The target group was people who have Dutch nationality and at least young adult (18 years above).

In order to obtain many respondents as possible the surveys were sent to groups of people who would have interested in a new food product.

- Database of the Food Quality and Design Group at Wageningen University
- Food Technology students at HAS Hogeschool (University of applied science)
- Personal contacts
3.4 Analysis

The data from the respondents was obtained by the ‘data manager’ in the Sawtooth Software. The data was divided into three groups: completed, incomplete, and disqualified. Only the data from the completed group was considered for the analysis. First step was screening the answers (which is discussed in the next chapter), followed by calculating the individual utility scores and the importance of attributes.

Calculating individual utility scores and importance of attributes:
Using the Sawtooth Software the individual utility scores were calculated by Hierarchical Bayesian (HB) estimation. In order to be able to compare the attributes, the data was rescaled using the zero-centred difference method (Orme, 2009). Also, the importance scores of attributes were calculated this way.

As the following step, the utility scores and importance scores were analysed using One-way analysis of variance (ANOVA) with Fisher’s least significant difference in order to determine significant differences between levels in each attribute, and between attribute. This was carried out using the IBM SPSS statistics software.
Chapter 4 – Results and discussion

4.1 Screening the answers

In total there were 163 Dutch respondents, including 126 completed, 37 incompletes and 8 disqualified. For optimum results 125 respondents were selected based on their consistency and timing in answering the survey. Each respondent’s answers were evaluated whether they provided serious answers to every question: “Do his/her answers make sense?” For example, it does not make sense if the respondent chose the same level to all health statements in the last part of the survey since the health statements had contradicting contexts. For example, “I do not often think about whether everything I do is healthy” (point 9) is contradicting with “I consider myself to be very health conscious” (point 2). In case of the removed respondents’ answers, the respondent selected for every health statement “1”. However, it is realistic if the respondent chose ‘neutral’ (level 3) to every health statement. There were two respondents who selected ‘neutral’ to all health statements. The answers of these respondents were further screened and other answers seemed to be relevant.

Another focus point during the screening is the elapsed time of answering the whole survey. Respondents who did it within 300 seconds and longer than 30 minutes were filtered (the outliers of the distribution of elapsed time was at longer than 30 minutes). There were 11 respondents in this category and their answers were thoroughly screened (the realistic and logic answers).

4.2 Demographics

4.2.1 Gender, Age and Education

Table 4.1 shows an overview of the distribution of gender, age and education among the respondents. There were more females (66.4%) than males (33.6%) respondents. All groups of age are quite equally distributed: 26.4% young adults; 30.4% adults; 24.8 % middle age; and 18.4 % elderly. Regarding their education, most respondents have MBO or HAVO/VWO diploma (39.2%). Followed by HBO or Bachelor (30.4%), Master or higher (26.4 %) and LBO, MAVO or VMBO (0.04%). None of the respondents have lower education than the latter.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Middle School (LBO, MAVO or VMBO)</th>
<th>High School (MBO or HAVO/ VWO)</th>
<th>College/Bachelor (HBO or Bachelor)</th>
<th>Master or higher</th>
<th>Total (age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>18-25</td>
<td>0</td>
<td>21</td>
<td>4</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>26-40</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>41-60</td>
<td>0</td>
<td>8</td>
<td>11</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>61+</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Male</td>
<td>18-25</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>26-40</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>41-60</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>61+</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Total (education)</td>
<td>5</td>
<td>49</td>
<td>38</td>
<td>33</td>
<td>89</td>
<td></td>
</tr>
</tbody>
</table>
The respondents were mainly young females (18-25 years) who tend to have more interest in snack-related foods, than men who prefer more meal-related food (Wansink, Cheney, & Chan, 2003). Most male respondents were in the middle age (26-40 years) and highly educated (master or higher). Figure C3 and C4 in appendix C showed the difference of preferences between female and male. No significant difference between these two groups was found and it might be influenced by the larger group size in female.

4.2.2 Region

Figure 4.1 depicts the distribution of the region (province scale) that the respondents selected as their place of residence. For simplicity these results were grouped per province. The highest number of respondents were resident of Gelderland (44%). Initially, the survey was sent to people of the Database of the Food Quality and Design Department of Wageningen University, the Netherlands. For this reason, it was expected to receive higher number of respondents from this region. The second big group of respondents live in Zuid-Holland (25%) due to personal contacts of the researcher of this study. The third big group live in Noord-Brabant because the survey was also distributed to students from Food Technology major at HAS Hogeschool (University of Applied Science) located in Noord-Brabant. The remaining groups of respondents live in the following regions: Utrecht, Noord-Holland, Groningen and Overijssel.

![Figure 4.1 Provinces of residence among the respondents.](image)

The provinces of the Netherlands can also be categorized according to the first level NUTS (Nomenclature of territorial units for statistics) classification (RegioAtlas, 2017). The respondents came mostly from the Eastern region of the Netherlands (46,4 %) and the Western region of the Netherlands (37,6 %).

4.3 Frequency of consumption

Only 2 respondents have never eaten fresh mango before and 1 respondent has allergy to fresh mango. About half of the respondents answered “no” (51.2%) to the question: “have
you ever eaten DM before?”. Figure 4.2 shows the graph of the frequency of consumption of DM. Most respondents have never eaten DM (48%) and have eaten a few times a year (43.2%).

As you may notice there is a slight difference in answers between the question “have you ever eaten DM before?” and the question “how often do you eat DM?”. This is possible because ‘skip logic’ function, which can skip a question after a certain answer, was not used in this part. There were 3 respondents who answered first “no”, then “a few times a year”. Although this is not logic, these respondents were not deleted from the analysis because other answers of the survey were acceptable.

Since there was an evenly distribution of DM eaters (48,8 %) and DM non-eaters (51,2 %), the difference between these groups was also analysed. Figure C1 and C2 (in appendix C) showed no significant difference between the preference of eaters and non-eaters. Although DM eaters consumed DM before, they mostly consume it a few times a year as it showed in figure 4.2. Their familiarity to DM was still considered low.

4.4 Importance of intrinsic quality attributes

In order to answer first research question “What is the profile (importance) of intrinsic quality attributes of DM that is most preferred by the consumers?”, the importance scores of the data were calculated and analysed. First, the overall importance of preference among all Dutch respondent will be discussed in this section. Followed by the importance among different categories of consumers: eaters and non-eaters, female and male and age groups.

4.4.1 Overall importance

Figure 4.3 depicted the graph of the overall importance of intrinsic quality attributes. Extra ingredients of DM was the most important intrinsic quality attribute among the Dutch respondents, followed by sweetener. Dominant texture and dominant taste of DM were also considered important intrinsic quality attributes by the Dutch consumers. Similarity to the fresh mango flavour and the colour of DM were the least important.
A DM inhibiting the fresh mango flavour was expected to be positioned at the higher rank of importance since this attribute was related to the additives of DM. In general, similar taste to fresh mango would be perceived as more natural product. However, the dominant texture and taste were more important than the fresh mango flavour and colour. The low familiarity of DM among Dutch consumers can influenced this result. Moreover, during the pilot test of the survey, several respondents did mention that it was difficult to imagine DM when filling in the survey. It could be that Dutch consumers compared DM with other dried fruits for ‘snacks’ or ‘on-to-go’ context. This was the case in the previous qualitative study (van Oirschot, 2016). Dutch consumers perceived dried fruits as something (very) sweet, and rarely salty. It was also relevant to mention that they had dried fruit for ‘direct consumption’ type in their mind. Raisin was the most popular in this category of food, so most Dutch consumers would probably imagine ‘chewy’ and ‘sweet’ raisins. They would imagine differently if it was ‘breakfast’, for instance, as a consumption context, such as ‘hard’ and ‘sweet’ dried banana to add in their cereal. So, Dutch consumers had high preference of a distinctive texture and taste towards DM for direct consumption.

The fresh mango flavour and the colour of DM were the least important. One reason for the low importance of the colour was that the fresh mango or DM in the Dutch market is usually from pale yellow to orange. This range of colour do not deviate much in the eye of consumers. Furthermore, also this result can be influenced by the low familiarity of DM. Most respondents never or rarely have eaten DM before, so they might compare it with the colour of fresh mango. Another possible reason was that the consumers were willing to compromise on taste for health (Verbeke, 2005). The respondents could acknowledge that a product without any additives gave influences on the decrease of fresh mango flavour and colour (lighter colour) (Francis, 1995). Therefore, they could accept these sensory attributes and perceived them as least important. Nevertheless, according to Verbeke (2005) it is highly risky to yield a market strategy with hoping for consumers to compromise on the taste for health.
4.4.2 Importance of intrinsic quality attributes with respect to different groups

**Eaters vs. Non-eaters**
In this part, the comparison between importance of different demographic groups was made. In figure C1 and figure C2 in appendix C the relative importance with respect to *eaters* was compared to *non-eaters*. There was no significant difference between eaters and non-eaters.

**Female vs. Male**
The relative importance with respect to *female* compared to *male* can be found in figure C3 and figure C4 in appendix C. Also, this comparison had no significant difference.

**Age groups**
The relative importance with respect to *young adults*, *adulthood*, *middle age* and *elderly* is shown in figure 4.5. It showed extra ingredients was still the most important attribute for all ages. It was observed that the overall importance among *young adults* tend to be less compared to other age groups. Regarding the sweetener, it was equally important as extra ingredients according to the *young adults* and *elderly*. Elderly group was known for their concern about their calorie-intake. Moreover, figure C4 and C5 (appendix C) indicated that elderly consumers preferred more sweet than sour and a natural sweetener.

In other hand, young adults were known for their sweet food choice, especially in the context of ‘snacks’. Moreover, the ‘dominant taste’ attribute was positioned higher by young adults. This can confirm their distinctive importance of the taste of DM compare to other age groups. Another interesting point is that the dominant taste was included as the least important attribute for *middle age* group and *elderly* group. It was known that there is a relation between age and food taste. Elderly people is often suffered from olfactory and/or taste deficits (Drewnowski, 1997; Wysocki & Pelchat, 1993). Dominant taste would irrelevant for them and the dominant texture was more important. However, the extra ingredient was still the upmost important intrinsic quality attribute of DM for all groups of age.
4.5 Individual utility of intrinsic quality attributes

In order to answer the second research question: “What is the consumer’s preferences (level of attributes) of intrinsic quality attributes of DM?”, the utilities of each attribute were calculated among all respondents. In addition, the utilities with the respect of different health-orientation groups were calculated for more understanding of their differences.

Figure 4.7 shows the graph of overall utilities of each intrinsic quality attribute. In the following, the preference of individual intrinsic quality attribute will be described, from the most important to the least important attribute respectively:

- Extra ingredients:

The most important and preferred intrinsic quality attribute of DM was clearly no extra ingredients. Spices was less attractive, followed by the combination of salt and spices. Salt was the least preferred.

- Sweetener:

A sweetener containing low calories and natural sweetener, such as stevia, is preferred. Sugar/honey (high calories) was the least attractive attribute, followed by artificial sweetener
(no calorie). Sugar/honey and artificial sweetener would therefore have negative influence in the choice of consuming DM.

- **Dominant texture:**

  Chewy is the preferred texture of DM by the respondents. There was no significant difference between crispy and soft DM and they were negative, so both of the texture were the least wanted to the Dutch consumers.

- **Dominant taste:**

  More sweet than sour, and balanced sweet and sour were not significant different and were preferred. More sour than sweet is the least wanted attribute.

- **Mango flavour:**

  Mango flavour and colour were the least important attribute to the respondents. DM with similar flavour as fresh mango is the most preferred for this attribute, followed by stronger flavour than fresh mango. Weaker flavour than fresh mango was unwanted.

- **Colour:**

  As it was mentioned previously, colour was also the least important. The respondents chose pale yellow and pale orange as most appealing colour toward DM. Bright and dark orange were the least preferred.

![Figure 4.5 Relative utilities (zero-centred Diffs) of intrinsic quality attributes of DM by the Dutch respondents (n=125). These relative utilities summarize how the respondents preferred toward to every level of intrinsic quality attributes. Higher utility, from negative to positive value, means higher preference compared to others. Different letters indicate significant differences between attributes (p-value <0.05).](image-url)
4.5 Health orientation

The third research question was: “What is the profile and preferences of intrinsic quality attributes between the consumers with different health orientations?” The health orientations were divided to low health sacrifice and high health sacrifice.

Dutch consumers who tended more to sacrifice for health, ranked the sweetener equally as important as the extra ingredients. In contrast with the low health-sacrifice consumers, they found sweetener less important than extra ingredients.

**High and low health sacrifice groups**

The relative importance with respect to high health sacrifice and low health sacrifice are depicted in figure 4.6. Here, extra ingredients was still the most important attribute among these different health-orientation groups. For high health sacrifice group, sweetener was equally important as extra ingredient. In contrast, low health sacrifice group positioned sweetener as less important than extra ingredients. Dominant texture was the followed important attribute for both groups. For low health sacrifice, mango flavour and colour were significantly the least important attributes. In general, there were very little significant differences between the attributes in high health sacrifice group than low health sacrifice group.

![Figure 4.6 Relative importance with respect to group of high health sacrifice (left, n=34) and low health sacrifice (right, n=91). Different letters indicate significant differences between attributes (p-value <0.05).](image)

In addition, the relative utilities from different health-orientation groups was also analysed because their importance had several differences as shown in figure 4.7 and figure 4.8. There were significant differences found in the level of sweetener, dominant texture, fresh mango flavour and colour. The high health-sacrifice group had positive utilities in artificial sweetener (no calories), soft dominant texture, stronger flavour than fresh mango, pale orange colour and bright orange colour. The low health-sacrifice group in other hand, their utilities for the aforementioned levels of attributes were negative. So, this confirms that high health-sacrifice people were more positive to the health aspects of DM as it was expected from Sijtsema et al. (2011).
Figure 4.7 Relative utilities (zero-centred Diffs) of intrinsic quality attributes of DM among high health sacrifice group (n=125). These relative utilities summarize how the respondents preferred toward every level of intrinsic quality attributes. Higher utility, from negative to positive value, means higher preference compared to others. Different letters indicate significant differences between attributes (p-value <0.05).

Figure 4.8 Relative utilities (zero-centred Diffs) of intrinsic quality attributes of DM among low health sacrifice group (n=125). These relative utilities summarize how the respondents preferred toward every level of intrinsic quality attributes. Higher utility, from negative to positive value, means higher preference compared to others. Different letters indicate significant differences between attributes (p-value <0.05).
Chapter 5 - Conclusion

This chapter described the important findings and argumentations aiming to answer the main research question ‘What are the preferences to intrinsic quality attributes of DM among Dutch consumers?’.

In this study, the conjoint analysis with the data of 125 Dutch respondents provided many insights of their preferences to intrinsic quality attributes of DM. It was found that the most important intrinsic attribute of DM was the health-related attributes. DM with extra ingredients (e.g. spices and salt) was the main barrier for the Dutch consumers to purchase or consume the DM. This counts for all Dutch respondents including different groups of ages, gender, DM eaters, DM non-eaters, and health-orientations.

There was a distinctive preference by the elderly people compared to other groups of age, namely the sweetener attribute, as been seen in figure 4.5. Since age is related to deficits in taste and smell, it could be that elderly people prefer sweeter DM with low or no calories (Drewnowski, 1997) as it also been seen in figure C4 and C5 in appendix C. If Dutch elderly people were chosen as the target group, then it would be necessary to focus more on the sweetener attribute of DM. For example, stevia is a well-known natural sweetener (200 to 300 times more sweet than sugar) providing almost no calories, which could be a potential ingredient to add on DM for elderly age group (Voedingscentrum, 2017).

Regarding the sensory-related intrinsic quality attribute, the most preferred texture of DM was chewy (e.g. raisins). In other hand, the crispy texture was unwanted as it was also the barrier for consumption of DM (van Oirschot, 2016). From the focus group research, the DM was several times perceived as a dry product before the consumption of DM. The dryness of the product does not resemble fresh fruit, which was perceived as less healthy feeling and no nutrients. Raisins in other hand, its chewy texture was preferred mentioned by some participants in the focus group. Therefore, imitating the DM with a similar texture as raisins with the least loss of nutrients would provide advantages in the product development of DM.

Regarding dominant taste of DM, ‘more sweet than sour’ and ‘balanced sweet and sour’ were preferred to all Dutch consumer groups. Dutch consumers would avoid to consume DM that has more sour taste than sweet. The preferences of the remaining sensory-related attributes were ‘similar flavour as fresh mango’ and ‘pale yellow and pale orange’. Before this study it was not clear about the preference on the resemblance taste of DM with fresh mango. This attribute was perceived as motives in different levels (van Oirschot, 2016). Nevertheless, the Dutch consumers would avoid DM with weaker taste than fresh mango. Considering these attributes in the product development of DM would provide advantages or extras for Dutch consumers.

Regarding the influence of health-oriented consumers, it could be concluded that people who tended more to sacrifice for their health would be better target group for DM than the low health-sacrifice people. People who were less to sacrifice for their health would criticize the DM and difficult to satisfy their desires. Thus, the high-health sacrifice consumers would perceive DM as more likely as a healthy snack.
Furthermore, applying the chosen conjoint method (ACBC) in this research was very effective in obtaining the insights of the consumer preferences. The only limitation to this method was that the number of attributes to analyse should be as low as possible in order to avoid a tedious survey for the respondent. During the pilot test, this was the main issue for almost all participants of the pilot test.

In conclusion, the Dutch consumers seemed to value the natural DM without any additives even if its production process affected the colour of DM and the taste of DM. In the recent years there was and still an on-going trend of increasing demand of organic products in the Netherlands (Bionext, 2016). More Dutch consumers were also willing to pay more for organic products (Bionext, 2016). Therefore, it would be worthwhile to continue this research on DM in the following steps of the new product development of DM for Dutch consumers.
**Recommendation**

As it was mentioned before, this study was a continuation of the qualitative study on dried tropical fruit and dried mango among Dutch consumers. This quantitative study, along with the latter study would provide a completed insights of the Dutch consumers towards dried mango. With these insights, the creativity thinking about the product concept could be the next step in the opportunity identification for DM.

Initially, this research was with more attributes than the six intrinsic quality attributes. The attributes that were related to the consumption context were eliminated due to the limitation of conjoint analysis method (ACBC). However, through the discussion of this research it seemed that the consumption context did matter on the consumer preferences among Dutch consumers. Further research of the consumer preference on the context-related attributes seemed to be insightful for further understanding of the consumers.

The respondents’ data in this research could be used for further research on this topic. There were more possible analyses on the differences of preference with respect to various consumer characteristics. Due to the time limitation in this research the following relations was not researched yet:

- Respondents from the Eastern and the Western of the Netherlands region;
- Respondent with ‘high school’, ‘bachelor or college’, and ‘master or higher degree’.
References


CBie. (2014). *The EU market for dried mangoes*. Center of the promotions of import from developing countries. Ministry of Foreign Affairs.

Cross, J., & Engfehr, K. (Directors). (2010). *Fat, sick and nearly dead* [Motion Picture].


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Appendices

Appendix A: Intrinsic Quality Attributes from FGD (page 38)
Appendix B: Survey sample (page 39 – 47)
Appendix C: Figures related to the results (48-50)
## Appendix A: Intrinsic Quality Attributes from FGD

Table 3.1 Health and sensory attributes mentioned during FGD reported by Van Oirschot (2016).

<table>
<thead>
<tr>
<th>Category</th>
<th>Attributes</th>
<th>Sub-attributes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Nutritional content</td>
<td>Fibre</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Health effect/nutritional value</td>
<td>Problems with your intestines/bowel movement</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less healthy due the processing of DF (loss of nutrients)</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less healthy feeling (less moisture, less juicy)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Healthy compared with other snacks</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Natural content</td>
<td>Better fruit pieces as additives</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Healthier than sugar</td>
<td>1</td>
</tr>
<tr>
<td>Sensory</td>
<td>Flavour (taste)</td>
<td>sour/sourish</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sweet</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>too sweet</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sweet and sour</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- pleasant taste</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>resembles fresh mango</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>do not resemble fresh mango</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>taste release while chewing</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bitter aftertaste</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tasty dried pieces (addition)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>flavour (smell)</td>
<td>Comparable to fresh fruit</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>very sweet</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Texture</td>
<td>soft:</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- pleasant texture</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hard/tough</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crispy/dry</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>chewy</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>compares in a good way with fresh mango</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gelatin structure</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Appearance</td>
<td>fibre mango can be found in dried form</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bright color</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix B: Survey sample

Beste deelnemer,

Wij zijn onderzoekers van de Wageningen Universiteit. We doen een consumentenonderzoek voor de productontwikkeling van gedroogde mango in China, Indonesië en Nederland. Het doel van dit onderzoek is om te begrijpen hoe consumenten gedroogde mango het liefst willen hebben. We willen graag weten welke eigenschappen van gedroogde mango voor u belangrijk zijn als u dit product zou eten.

Deze enquête bestaat uit zes delen en zal ongeveer 15 minuten duren. Alle informatie wordt vertrouwelijk behandeld.

Hartelijk dank voor uw deelneming!

Met vriendelijke groet,

Claire Setjadiningrat, Bea Steenbekkers en Ita Sulistyawati
Wageningen Universiteit
DEEL 1 - ACHTERGRONDINFORMATIE
In dit eerste deel gaan we vijf demografische vragen aan u stellen: uw nationaliteit, woonplaats, geslacht en educatieachtergrond. Dit gaat ongeveer 1 minuut duren.

• Wat is uw nationaliteit?
  o Nederlands
  o Anders

• Wat is uw woonplaats?
...

• Wat is uw leeftijd?
...

• Wat is uw geslacht?
  o Man
  o Vrouw

• Wat is uw hoogst behaalde opleiding?
  o Basisschool
  o LBO, MAVO of VMBO
  o MBO of HAVO/VWO
  o HBO of Bachelor
  o Master of hoger
DEEL 2 - ERVARINGEN
In dit deel willen we weten wat uw ervaringen zijn met verse mango en gedroogde mango. Dit deel zal ongeveer 1 minuut duren.

- Heeft u eerder verse mango gegeten?
  - Ja
  - Nee
  - Ik ben allergisch voor mango

- Heeft u eerder gedroogde mango als enkel product* gegeten?
  - Ja
  - Nee
* “gedroogde mango als enkel product” betekent dat u de gedroogde mango niet eet in combinatie met andere producten (b.v. gedroogde mango in muesli).

- Hoe vaak eet u gedroogde mango?
  - Dagelijks
  - Wekelijks
  - Maandelijks
  - Paar keer per jaar
  - Nooit gegeten
DEEL 3 – CREËR UW EIGEN GEDROOGDE MANGO

In dit deel krijgt u de mogelijkheid om gedroogde mango naar eigen wens te creëren. Hoe wilt u gedroogde mango het liefst hebben? Dit deel zal ongeveer **3 minuten** duren.

*Instructie*: Hier volgt een lijst met de eigenschappen van gedroogde mango. Voor elk eigenschap wordt een lijst met verschillende mogelijkheden gegeven. Selecteer uw voorkeur door één optie te kiezen bij elke eigenschap hieronder.

Als u geen voorkeur heeft voor een van de eigenschappen, selecteer dan de optie die voor u het best past. De software zal hier rekening mee houden in het volgende deel van de vragenlijst.

**N.B.** Voedingsediteieven zijn soms noodzakelijk om gedroogde mango te produceren.

<table>
<thead>
<tr>
<th>Eigenschappen</th>
<th>Selecteer eigenschap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mango smaak</td>
<td>- Zwakkere smaak dan verse mango</td>
</tr>
<tr>
<td></td>
<td>- Vergelijkbare smaak als verse mango</td>
</tr>
<tr>
<td>Dominante smaak</td>
<td>- Een meer zoete dan zure smaak</td>
</tr>
<tr>
<td></td>
<td>- Gebalanceerde zoete en zure smaak</td>
</tr>
<tr>
<td>Kleur</td>
<td>- Een meer zure dan zoete smaak</td>
</tr>
<tr>
<td>Dominante structuur</td>
<td>- Taai (b.v. rozijnen)</td>
</tr>
<tr>
<td></td>
<td>- Zacht (b.v. rijpe banaan)</td>
</tr>
<tr>
<td></td>
<td>- Krokant (b.v. Lay’s chips)</td>
</tr>
<tr>
<td>Zoetstof</td>
<td>- Hoge calorieën (b.v. suiker en honing)</td>
</tr>
<tr>
<td></td>
<td>- Lage calorieën, natuurlijke zoetstoffen (b.v. fruitsuiker)</td>
</tr>
<tr>
<td></td>
<td>- Geen calorieën, kunstmatige zoetstoffen (b.v. saccharine)</td>
</tr>
<tr>
<td>Extra ingredienten</td>
<td>- Zout</td>
</tr>
<tr>
<td></td>
<td>- Kruiden (b.v. chili en gember)</td>
</tr>
<tr>
<td></td>
<td>- Combinatie van kruiden en zout</td>
</tr>
<tr>
<td></td>
<td>- Geen extra ingredienten</td>
</tr>
</tbody>
</table>

Voordat we naar het volgende deel gaan, graag even controleren of u alle vragen heeft beantwoord.

DEEL 4 – IS DEZE COMBINATIE NOG ACCEPTABEL VOOR U? (n-times)

We hebben uw keuzes van het vorige deel meegenomen. In dit deel geven we u een aantal combinaties van eigenschappen van gedroogde mango. Elke gegeven combinatie varieert een beetje ten opzichte van uw eigen keuze. Bepaal voor elke combinatie of deze voor u acceptabel of niet acceptabel is.
Mocht het zo zijn dat er geen enkele combinatie acceptabel is voor u, dan kunt u dat gerust aangeven. Het systeem zal de antwoorden analyseren en daarna nieuwe combinaties voorstellen, die mogelijk wel aan uw voorkeur voldoen.

Dit deel zal ongeveer 5 minuten duren.

![Table](image)

*Voordat we naar het volgende deel gaan, graag even controleren of u alle vragen heeft beantwoord.*
DEEL 4 – IS DEZE COMBINATIE NOG ACCEPTABEL VOOR U?

**HET IS VOOR MIJ ONACCEPTABEL, ALS GEDROOGDE MANGO ... HEEFT**
We zien dat bepaalde eigenschappen van het product voor u ongewenst zijn. Is een van deze eigenschappen echt onacceptabel? **Selecteer dan hieronder de eigenschap die voor u het meest onacceptabel is.** Zo kunnen we focussen op de combinatie die beter bij u past.

- Kleur -
- Dominante structuur - Taai (b.v. rozijnen)
- Zoetstof - Hoge calorieën (b.v. suiker en honing)
- Extra ingrediënten - Zout
- Dominante smaak - Een meer zoete dan zure smaak
- Mango smaak - Zwakkere smaak dan verse mango

Geen enkele van deze eigenschappen is onacceptabel.

DEEL 4 – IS DEZE COMBINATIE NOG ACCEPTABEL VOOR U?

**VOOR MIJ MOET GEDROOGDE MANGO ... BEVATTEN**
We willen niet zomaar conclusies trekken en we zien dat u bepaalde eigenschappen van het product heeft gekozen (zie hieronder). Het zou ons helpen om te weten welke eigenschappen noodzakelijk zijn voor u. **Selecteer hieronder de eigenschap die voor u essentieel is.** Zo kunnen we focussen op de combinatie die het best bij u past.

- Dominante smaak - Een meer zoete dan zure smaak
- Mango smaak - Zwakkere smaak dan verse mango
- Extra ingrediënten - Zout
- Dominante structuur - Taai (b.v. rozijnen)
- Zoetstof - Hoge calorieën (b.v. suiker en honing)
- Kleur -

Geen enkele van deze eigenschappen is essentieel voor mij.
**DEEL 5 – IK HEB LIEVER ALS GEDROOGDE MANGO ... HEEFT** (m-times)

U nadert nu het einde van de enquête. We hebben al uw keuzes van elke combinatie bij het vorige deel overwogen. In dit deel hebben we aantal combinaties van gedroogde mango voor u gekozen, waarvan u de combinatie die u het meest aanspreekt moet kiezen. Dit zal ongeveer **3 minuten** duren.

**Instructie:** Lees ze aandachtig en maak een keuze van de combinatie die u het meest aanspreekt. (Om de nadruk te leggen op de verschillen, hebben we de eigenschappen die gelijk zijn bij alle combinaties dezelfde kleur gegeven)

(1 van 7)

<table>
<thead>
<tr>
<th>Mango smaak</th>
<th>Dominante smaak</th>
<th>Zwakkere smaak dan verse mango</th>
<th>Zwakkere smaak dan verse mango</th>
<th>Zwakkere smaak dan verse mango</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kleur</td>
<td>Zacht (b.v. rijpe banaan)</td>
<td>Een meer zoete dan zure smaak</td>
<td>Een meer zoete dan zure smaak</td>
<td>Een meer zoete dan zure smaak</td>
</tr>
<tr>
<td>Dominante structuur</td>
<td>Hoge calorieën (b.v. suiker en honing)</td>
<td>Taal (b.v. rozen)</td>
<td>Geen calorieën, kunstmatige zoetstoffen (b.v. saccharine)</td>
<td>Krokant (b.v. Lay's chips)</td>
</tr>
<tr>
<td>Zoetstof</td>
<td>Geen extra ingrediënten</td>
<td>Geen extra ingrediënten</td>
<td>Geen extra ingrediënten</td>
<td>Zout</td>
</tr>
</tbody>
</table>
**DEEL 6 – IK DENK DAT IK ... BEN**

U bevindt zich in het laatste deel van de enquête. Nu we meer weten hoe u gedroogde mango het liefst wilt hebben, vinden we ook belangrijk om te weten hoe gezondheidsbewust u bent. Dit deel duurt ongeveer 2 minuten.

Instructie: Geef aan in hoeverre u mee eens of oneens bent met elke uitspraak hieronder.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ik heb de indruk dat ik veel opoffert voor mijn gezondheid</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik beschouw mijzelf als erg gezondheidsbewust</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik ben bereid om alles te doen, om zo gezond mogelijk te eten</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik denk dat ik veel met gezondheid rekening houd in mijn leven</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik denk dat het belangrijk is om te weten hoe je gezond moet eten</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Mijn gezondheid is erg waardevol voor mij. Ik ben bereid om daarvoor veel dingen op te offeren</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik heb de indruk dat anderen meer op hun gezondheid letten dan ik</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik vraag me niet voortdurend af of iets goed is voor mij</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik denk of niet telkens aan of alles wat ik et of gezond is</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik wil me niet voortdurend afvragen of de dingen die ik eet goed zijn voor mij</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ik ben altijd bezig met mijn gezondheid</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Graag even controleren of u alle vragen heeft beantwoord.
OPTIONELE VRAGEN

Wilt u een kans maken op VVV cadeaubon t.w.v. €15, vul hieronder dan uw e-mailadres in. Wij zullen u midden januari via e-mail bekendmaken of u de cadeaubon ontvangt.

Als u nog een opmerking heeft over de enquête of/en gedroogde mango, graag hieronder invullen:

Klik op de volgende om deze enquête te voltooien.

CLOSING (COMPLETED)

U BENT KLAAR MET DE ENQUIÊTE

Hartelijk dank voor uw tijd bij het invullen van deze enquête!

Als u verder vragen heeft, neem gerust met ons contact op: claire.setjadiningrat@wur.nl

CLOSING (DISQUALIFIED)

Sorry, deze enquête is uitsluitend voor Nederlandse respondenten. We hebben hierdoor de enquête beëindigd. Bedankt voor uw interesse.
Appendix C

EATERS VS. NON-EATERS

Figure C9 Relative importance of intrinsic quality attributes by DM eaters group (n=61)

Figure C10 Relative importance of intrinsic quality attributes by DM non-eaters group (n=64)
MALE VS. FEMALE

Figure C11 Relative importance of intrinsic quality attributes by DM Male group (n=41)

Figure C12 Relative importance of intrinsic quality attributes by DM Female group (n=82)
ELDERLY GROUP

Figure C13 Relative utilities of ‘dominant taste’ by elderly group (n=23)

Figure C6 Relative utilities of ‘sweetener’ by elderly group (n=23)