A nutritious and tasty snack concept for consumers of 50-65 years.

How can a nutritious and tasty product concept be developed for the baby boomer group in conformity with the snack-criteria from the Dutch Health Council, taking into account the low intake of nutrients and the trends among the target group?

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This essay has been written as the final part of the Bachelor Nutrition and Dietetics at the Hogeschool van Amsterdam. From February until the end of June, I worked on the development of a nutritional snack for consumers of 50-65 years. This essay contains a product concept for a nutritional snack, together with information about the target group.

During my previous internship at PepsiCo, I met Ben Bischoff in the potato chips factory. We talked about my project and about what kind of company Givaudan is. As I live close to Naarden, I already knew there was a factory that is making flavourings and fragrances. Therefore, I decided to call Ben to ask him if he had an interesting investigation for me. This essay is a result of this conversation.

As I am very interested in health, especially in the combination of health and enjoyment, this investigation was very interesting for me. I have been learning a lot about consumers' interests, marketing, product development and ingredients. I have been able to develop a product that can contribute to consumers' daily eating patterns and deepen my knowledge of the more technical side of product development.

I have only been able to write this essay with the help of many others. Therefore I would like to thank my practice supervisor Henri Roukens for all his technical knowledge and feedback. I would like to thank Joke, my tutor, as well, who amplified my vision and helped me into the right direction. I would also thank all the respondents who allowed me to interview them to get a clear view of their interests and snack behaviour. At last I really would like to thank Vicki Fritzsche who helped me to write this essay in good English.

Amsterdam, June 14 2010

Madeleine Goedegebuure
Background
Givaudan is the leading company in the fragrance and flavour industry. They work closely together with the food and beverages producing companies that are continually innovating and delivering new products. Givaudan is thinking along with these companies and helps the innovation and development of new products. The snack department of Givaudan is interested in developing a new and nutritional snack which fits in the trends and needs of a target group. The choice was to develop a snack for the baby boomers; the group of people who were born right after the Second World War. There are not many snack products available for them, and a healthy product might be an interesting gap in the market.

Target
The target of this investigation is to develop an innovative and healthy snack concept. This snack concept will fit in the needs and trends that are relevant for the target group and is developed for the food producing companies Givaudan is working with.

Method
First, market research was carried out to get more understanding about the target group and the trends that are relevant for the target group. The results of previous market research, giving information about the consumers, were already available at Givaudan. 13 consumers, who fall within the target group, have been interviewed. These interviews give a good overview of the needs and habits of the target group. Combining all this information, a product concept has been developed following three phases: exploration, screening and concept development. In the exploration phase, a Moodboard and a Mindmap have been created to get a visual view of the trends and needs that have been found in the market research and the interviews. During the screening phase all the product ideas have been screened and discussed. Brainstorming has been helping to see if the ideas are feasible. A product concept consisting four different sticks has been chosen to develop. The last phase of concept development consists of developing these four sticks and of optimizing them.

Results
The market research showed the trends that are relevant for the target group. Tasty, enjoyable, low fat and the use of whole grains, super fruits and ethnic condiments are shown as important aspects where a product concept can respond to. Interviewing confirmed the trends of tasty, low fat products, where quality comes before quantity. Interviewing the baby boomers gave more information about the moment they snack. Together with friends or family at the end of almost every afternoon is their enjoying and relaxing moment. They enjoy small, tasty portions of crispy snacks in savoury flavours as a treat for a day of hard working. Especially cheese flavours are popular among the seniors. Brainstorming has given product ideas that have been evaluated and criticized. The result is a product concept for a snack for consumers of 50-65 years. The snack concept consists of four different sticks, each made with different technologies and ingredients. These sticks contain ingredients that might contribute to health like legumes, nuts and seeds, dried fruit, vegetables, whole grains and fibres.

Conclusion
Four sticks have been developed based on the trends that have been found in the market research and the (nutritional) needs of the target group. The snack concept is suitable for food companies that can develop the concept further to its own interests and style. Every stick has its own characterisations like texture, nutritional aspects and flavour. Together they are a mix of cultures and an experience for a relaxing moment with friends or family at the end of the afternoon.

Key words: Seniors, Product Development, Nutritional, Snack.
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Givaudan is the leading company in the fragrance and flavour industry. Givaudan's wide range of expertise is categorized under the following innovation pillars: Sensory Intelligence, Sensory Creation, Sensory Technology, and Sensory Science. By further developing these capabilities, Givaudan can accomplish its goal of becoming the Essential Source of Sensory Innovation.

Givaudan focuses on the challenges that food and beverage companies over the world face as they go about growing their brands, and making products that consumers love. With competition growing on a global scale, brand value has never been more important. Even top brands cannot sit still in a cluttered marketplace. Companies need to continually innovate and deliver new products. And not just any product, but products with the right flavour the first time. Givaudan can help.

Givaudan the Netherlands is situated in Naarden. The snack department where I am following my internship has its own Centre of Excellence (CoE). The most critical mass is here to give support to the local units. The CoE Snacks delivers a proactive role to other businesses. Arising from this they are very interested in investigating a new nutritional product which they can take with them to their clients. This nutritional snack will be intended for a specific target group and must fit in with their (nutritional) needs.

**Target group**

This product concept focuses on seniors of 50-65 years who are interested in their health. This target group is part of the Givaudan presentation Snack Your Age® which has the goal to develop products for specific age groups in Europe.

The group of people who were born during the baby boom between 1940 and 1960 is the reason for the increase in the seniors. The baby boomers were born after the Second World War and are now about 50 years or older.

This group of people is still very active and would like to stay vital. They are very interested in living a healthy life. They would like to stay young and vital so they will be able to travel around the world. They also enjoy playing sports and want to have time and energy to play with their grandchildren.

**Needs target group**

The visible trend of this group is the great interest in health. They are conscious of their heart and their cholesterol levels, so they try to balance their weight and keep an active lifestyle. They are interested in healthy food and prefer quality before quantity. In addition, they like to enjoy their food; not in large amounts but in small quantities. Small portions are preferred. They also have their enjoying moments when they consume a snack, alone or with others.

The snack moment for this group is around 5 p.m., combined with a glass of wine or another drink.

The reasons why people like snacks are:

- reward and indulgence
- convenience (on the go and workplace)
- social activity
- nutritious or beneficial for health
- stress relief
- boredom

The concern is that snacks are unhealthy (fat and calorie content) and people get a guilty feeling from eating snacks.

According to this understanding, a healthier snack is required. Therefore it would be beneficial if consumers could make easier, healthy choices.
Givaudan is very interested in developing a healthy snack which fits in the needs of this specific target group.

The main problem of this essay is:

**A nutritious and tasty snack concept for consumers of 50-65 years.**

How can a nutritious and tasty product concept be developed for the baby boomer group in conformity with the snack-criteria from the Dutch Health Council, considering the low intake of nutrients and the trends among the target group?

To make a healthy snack, a definition of a snack is required:

*A small meal that you eat quickly between main meals (sweet & savoury)*

The savoury snack department where I am following my internship specialises in snacks like crackers, extruded snacks, pretzels, biscuits, popcorn, potato crisps, tortilla crisps, seeds and nuts.

The following sub-questions will be answered in this essay:

- For which target group will the new product be developed?
- Which food trends are of influence on the target group?
- Of which nutrients does the target group have a shortage or low intake?
- What are the health problems the target group is facing?
- Which ingredients contain the nutrients the baby boomers have a deficit of?
- How do the nutrients react in a product in combination with other nutrients?
- What are the requirements for a healthy snack?
- Which legislation about food labelling and nutrition claims is available?
- How can a product concept be created based on the trends and needs of the target group?
Before starting with the development of the nutritional snack, some background information is required. The background information takes a closer look at the (nutritional) needs of the target group. As the target group is facing health problems, they might have a need for a healthy and tasty (functional) snack which contributes to their health.

1.1. Food trends
The development of a snack for this target group of baby boomers is very interesting because there are not many products available which have been specifically developed for this group.

During the market and product research, the visible trends in the snack category became clear. Some specific trends of claims on new product introductions have been made visible. The following claims were often used:
- high fibre content
- less fat / less than 10% fat
- low salt
- no added sugar
- no artificial colours, flavours and preservatives

One of these claims might be used on the new product, depending on the type and amount of ingredients in the product. The background information provides information about the legislation of using claims on the packaging.

Food trends in America
Looking at the trends in America, consumers' food interest is changing. Consumers have specific aspects they would like to see in products, like freshness. Furthermore, consumers are interested in trendy products which are locally grown produced, in super fruits, organic produce, exotic fruits, micro vegetables/greens, heirloom tomatoes, specialty potatoes, fresh herbs, pomegranates and figs.2, 3

Trends in restaurants
In restaurants, locally-grown produce, locally-sourced meats and seafood and sustainability are at the top of the list of the culinary trends for 2009. Smaller portions are a growing trend, because this correlates with a lower price and fewer calories. Examples of small dishes are tapas, mezze and dim sum. Sustainable seafood and non-traditional fish are two main trends. Of the consumers who ordered fish in a restaurant, those with age of 55+ were most likely to order fish in a restaurant.2

Popular ingredients in restaurant dishes are: artisanal cheeses, black garlic, ancient grains, flatbreads, flower syrups/essence, flavoured, smoked and regional salts, vegetable ceviche and ethnic condiments like chimichurri, agave and whole-grain breads.3

Choosing a dessert, the most popular deserts were: artisan/homemade ice cream, dessert flights/combos, gelato/sorbet, drinkable desserts, fresh fruit desserts, traditional ethnic desserts, cheese boards and cupcakes.

1.2. Consumer nutritional needs
Some nutrients, when coming together in a product, might synergise. This means that a certain nutrient can enhance the absorption of another nutrient. This might give a health benefit and has therefore been taken into account. Furthermore a closer look is taken at the snack requirements to create a healthy snack which might fall in the healthy category. A health logo might indicate this health aspect. Therefore some information is given about food labelling and usage of a logo.
When developing a product, it is important to understand the nutritional needs of the target group. Then it will be possible to look at specific ingredients and make a balanced snack. Each consumer has his or her own specific nutritional needs. The nutritional need is dependent on gender, age, weight, height and activity level of a person. The nutritional needs for males and females above 50 years are described in Appendix I. The dietary reference values are based on the European values set up by the EFSA and completed with the Dutch dietary reference values set up by the Dutch Health Council.4

**RDA**
The Recommended Dietary Allowances (RDA) is a recommendation for everybody to prevent deficiencies. The RDA covers 98% of the population. Lower intakes of the RDA might lead to health problems, though, in addition, higher intakes might also lead to health problems. Therefore, an Upper Level (UL) has been developed based on investigation to prevent a toxic effect.
Sometimes, there is not enough scientific evidence to determine an RDA for a specific nutrient. In that case, an Adequate Intake (AI) is established, which reflects the average amount that a group of healthy people should consume.4

**Protein**
The last decade there have been many diets based on low carbohydrate and high protein contents like Atkins New Diet Revolution. These diets are high in protein based on the knowledge that protein has a satiating function which helps to eat less. A high protein content should also prevent muscle break down, which is relevant for the seniors.5
The links in the chains of proteins are called amino acids. The body can synthesize half of the 20 amino acids, but there are amino acids that the body cannot make itself. These are called the essential amino acids. The essential amino acids must be supplied by the diet. Appendix I contains a list with the amounts of essential amino acids required per day.

### 1.2.2. Food Consumption Survey
To investigate if consumers reach their RDA, a Food Consumption Survey (FCS) has been carried out by the RIVM, commissioned by the Dutch Ministry of Health, Welfare and Sport. The last FCS that was undertaken by the seniors in the Netherlands was in 1997-1998. This FCS has given an understanding of the intake of energy and nutrients for the total population of the Netherlands. During this study, only the needs of the seniors are viewed.
The results of this FCS are shown in Appendix II. These results are compared with the RDA, AI and UL, to see if consumers reach or exceed their nutritional recommendations.
Looking at the results of the FCS compared with the RDA, seniors have a low intake of the following nutrients, shown in table 1. The complete overview is shown in Appendix II.

| Table 1: Low intakes of nutrients for Dutch males and females of 50 – 65 years, based on the FCS (1997/1998) and RDA/AI. |
|---|---|---|
| Nutrients | Males | Females |
| Fibre (g) | 5 | sufficient |
| Vitamin C (mg) | 4 | sufficient |
| Vitamin D (µg) | 5.1 | 6.7 |
| Vitamin E (mg) | 0.4 | 3.8 |
| Potassium (mg) | 650 | 1200 |
| Calcium (mg) | 90 | 200 |
| Selenium (µg) | 2 | 13 |

Seniors have beside low intakes also high intakes of some nutrients. The intake of sodium is too high for both male and female, the intake of magnesium is too high for males. A high intake of sodium can cause high blood pressure or result in osteoporosis. A high intake of magnesium can result in intestinal complaints like diarrhoea.5
and excesses is the lower intake of vegetables, fruits and whole grains. These products are all highly nutritional products which are a good source of micro-nutrients and fibres.

Generally, the diet of the Dutch population shows many positive aspects. They have reduced the intake of saturated fat, mono unsaturated fatty acids and cholesterol and increased the fish intake. Unfortunately, the vegetable and fruit intake has gone down, and the intake of sodium as well as the beverage intake might be too high.

The Health Council of the Netherlands therefore recommends women above 50 years to increase the intake of vitamin D by taking supplementation of 10μg/day. The Health Council moreover recommends eating more fruit and vegetables. More fruit and vegetables will increase the amount of micro-nutrients and might decrease the risk of chronic diseases. Together with the consumption of whole grains the fibre intake will increase. Eating more fruit, vegetables and grains lowers the energy-dense foods and increases the nutrient-dense foods which might contribute to maintaining the body weight.

1.3. Ageing and health problems
When people get older they generally experience more health problems. Constipation is a growing problem as well as osteoporosis. Low physical activity combined with an unhealthy diet and lifestyle, will lead to more health problems. Overweight has increased during the last decade, as well as other health problems like chronic diseases: some types of cancer, heart disease, diabetes and arthritis. The diet plays an important role in these health problems, and together with adequate exercise, helps to maintain a suitable body weight.

Specific health improvers
I have been searching for ingredients for the new snack with specific nutrients contributing to health. As the target group is very interested in natural products, I have been searching for new but also historic (authentic) products. Whole grains and dried fruits and vegetables will increase the intake of anti-oxidants and fibres which contribute to better health. Below a list is given of specific health problems that might play a role in the target group. Per health problem, one or more ingredients are mentioned which could play an important role in reducing the risk of these health problems.

Menopause symptoms
Soy is a good source of protein; it contains all the essential amino acids. Soy furthermore contains isoflavones, which might reduce the symptoms of the menopause such as hot flushes. In addition it may increase the bone density in women. Furthermore, isoflavones might reduce the risk of cardio-vascular disease (CVD) by improving the cholesterol profile. Therefore, soy might be a good ingredient for the older women. On the other hand, soy is also an interesting product for vegetarians and vegans because of its amino acids profile.

Bone health
There are some specific vitamins and minerals that are good for bone health. Examples of these vitamins and minerals are: calcium, vitamin D, magnesium, phosphorus, boron, chromium, copper, zinc and vitamin K. Besides vitamins and minerals, an appropriate amount of protein is essential for bone growth. A combination of calcium and vitamin D enhances the intake of calcium. Rich sources of calcium are milk(products), poppy seeds and quinoa.
Coenzyme Q10 might be a healthy ingredient for the baby boomers. Coenzyme Q10 has an anti-ageing effect and might protect against suffering a heart attack. Coenzyme Q10 is found in some vegetables and fish. More about Coenzyme Q10 can be found in Appendix III.

**Heart disease**

Oats are rich in soluble fibres which might reduce the risk of heart disease. β-glucan is the soluble fibre in oats that can lower the cholesterol level. 3g of β-glucan a day is necessary for lowering cholesterol and reduce the risk of a heart attack by 10%. 11, 25

**Blood clots / Cardiac arrhythmias**

Walnuts are a rich source of poly unsaturated fatty acids, especially of alpha-linolenic acid (ALA). ALA is an omega-3 fatty acid which might have a positive influence on blood clots and cardiac arrhythmias.

A disadvantage of walnuts is their high energetic value; adding walnuts to the snack will make it hard to let the snack fall in category A (See table 3). 4

There are some interesting ingredients that might be suitable for the new product and the target group. These ingredients contain, for example, a high amount of specific vitamins and/or minerals, which might contribute to an adequate intake. Appendix III is giving information about the health aspects of these ingredients.

1.4. **Bioavailability**

The seniors have a low intake of the following nutrients:

- Fibre
- Vitamin C, D and E
- Potassium
- Calcium
- Selenium 6, 7

It is therefore important to use ingredients that are a rich source of these nutrients. Although an ingredient might have a high amount of some nutrients, not all the nutrients might be absorbed in the body. This is called the bioavailability: the amount of vitamins available from foods that can be absorbed by the body. 4

**Vitamin D and calcium**

As described before, the seniors have a higher risk of getting osteoporosis. More vitamin D is therefore required because it synergises with calcium and phosphorus in the body. This means that vitamin D enhances the uptake of calcium which is very effective. More calcium uptake will give better bone health.

Rich sources of calcium are milk and milk products. Milk products also have a high bioavailability.

Vegetables contain a smaller amount of calcium; nevertheless they have a higher bioavailability of calcium. Unfortunately, some vegetables and other natural products contain oxalate (in spinach) or phytate (in wheat bran, legumes, nuts, oats, soy beans, maize) which reduces the bioavailability of calcium. 12

**Fibres**

Fibres can bind with minerals, which inhibits mineral absorption. 4

On the contrary, inulin is a dietary fibre (oligosaccharide) with the possibility of enhancing the calcium uptake. A combination of whole grains and inulin is therefore a good way to enhance calcium uptake and deliver a high amount of fibre.
Vitamin E and vitamin C are able to enhance the absorption of iron. In addition, vitamin E is able to protect vitamin A and carotene from oxidative destruction. Using oil or using seeds and nuts which are rich in vitamin E, combined with fruit (source of vitamin C), enhances the uptake of iron.

1.5. Snack requirements
When consumers only eat their breakfast, lunch and dinner, they will have some free energy space left. This free energy space can be filled up with all kinds of food, like bread, fruit, milk(products), sweets and snacks. Table 2, drawn up by the Health Council of the Netherlands, shows the free energy space for males and females of 51-70 years. Our target group, with age 50-65 falls within this category. This free space should be divided over three ‘between meals’ moments. These figures therefore show how many calories a snack may contain to fit in a healthy lifestyle.

Table 2: Free energy space for males and females of 51-70 years

<table>
<thead>
<tr>
<th>Group</th>
<th>Energy requirement (kcal)</th>
<th>Energy basic (kcal)</th>
<th>Difference recommendation/basic (kcal)</th>
<th>Free space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males 51-70yr</td>
<td>2300</td>
<td>1800</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Females 51-70yr</td>
<td>1900</td>
<td>1600</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

On the basis of the criteria shown in Table 3, snacks can be divided into three categories. This is mentioned with A, B or C in Table 3. These categories define if the snack can be eaten ‘by preference’, ‘by compromise’ or ‘by exception’. When a snack contains ¼ of this free space energy (75kcal/portion) it falls in the A/B category of the criteria for non-basic food and is a healthier product. When a snack contains 1/3 of the free space energy (110kcal/portion), it falls in the B/C category of the criteria of non-basic food. This is shown in Table 3.

Table 3: Criteria non-basic food

<table>
<thead>
<tr>
<th>Product group / category</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snacks</td>
<td>Energy ≤ 75 kcal/portion</td>
<td>Energy ≤ 110 kcal/portion</td>
<td>Energy &gt; 110 kcal/portion</td>
</tr>
<tr>
<td></td>
<td>SF ≤ 13E%</td>
<td>SF ≤ 13E%</td>
<td>SF &gt; 13E%</td>
</tr>
<tr>
<td></td>
<td>TF ≤ 1,3E%</td>
<td>TF ≤ 1,3E%</td>
<td>TF &gt; 1,3E%</td>
</tr>
<tr>
<td></td>
<td>Na ≤ 400mg/100g</td>
<td>Na ≤ 400mg/100g</td>
<td>Na &gt; 400mg/100g</td>
</tr>
</tbody>
</table>

There are no requirements for a snack about its content of carbohydrates, proteins, fats and vitamins and minerals. The composition of fat should be more unsaturated than saturated or trans fat. A high amount of protein and a low amount of fat will be healthy, because protein improves bone health and gives satiety. The basic premise is that it is important to decrease the energy-density and increase the nutritional-density.
Food labeling

A food label gives detailed information to the consumer about the characteristics of the product. This information influences the purchase decisions of consumers and enables consumers to make a healthy choice.\(^\text{15}\)

When consumers are looking at the nutrition label, the following attributes are important: fats, calories, sugar, sodium, whole grains and chemical additives. Natural claims are important as well: product sales of products with a natural claim increased by 6% in 2009.\(^\text{2,3}\)

1.6.1. Guideline Daily Amount (GDA)

The Guideline Daily Amount has been developed to help consumers make healthier choices. The GDA gives nutritional information on the packaging of the product. It consists of two labels: One Front-Of-Pack (FOP) label and one Back-Of-Pack (BOP) label.

The FOP-label shows the number of calories in a portion of the product, together with the percentage of the daily energy requirement that is provided by one portion.

The BOP-label provides a more detailed list with nutritional information, like the amount of energy, sugar, fat, saturated fat, and sodium/salt in one portion.

The calories are shown in numbers per portion, the amount of sugar, fat, saturated fat and sodium/salt are shown in grams per portion. The percentage shows the quantity of the Guideline Daily Amount.\(^\text{16}\)

The GDA makes it easy to compare products in the same category and helps consumers to make a healthier choice. They are based on nutrition recommendations from the Eurodiet project, which consists of a panel of scientific and policy experts and has been established by the European Commission.

Picture 1: Example of a Front-Of-Pack label

As energy requirements are different per person, the values for adult women are taken, because these fit best with the needs of the majority of the population. These requirements can therefore be different from the requirements that are shown in Appendix I, because these requirements are specific to our target group.

1.6.2. Consumer research

Recently, consumer research on food labels was carried out in the UK, Sweden, France, Germany, Poland and Hungary. The goal of this study was to investigate the use of nutritional information on food labels and understanding of GDA front-of-pack nutrition labels in these six European countries.

The study shows that the main reason for consumers to buy a product is taste (52%), followed by that is what my family wants(13,4%), price/special offer (10,7%) and health/nutrition (8%).

When consumers look for nutrition information, they look the most at the amount of calories, fat and sugar. The following three sources are frequently used to find the nutrition information: the nutrition grid (a table or list on the back of the package), GDA label (on the front of the package) and the ingredients list.

The understanding of the GDA label was high in the UK, Sweden and Germany, and more limited in France, Poland and Hungary. Women, particularly those in the higher social classes, are more likely to look at the nutrition information.

The interest in nutritional information is lower for soft drinks, confectionery and salty snacks, compared with ready meals, yoghurts and breakfast cereal.

When health/nutrition is not the primary reason for buying a product, consumers find it less important to look at the nutrition information.

Older respondents tended to have more interest in healthy food, although they unfortunately had less nutrition knowledge.
As a result, it is not totally sure if nutrition labelling increases the proportion of making healthy choices. More publicity about nutrition and labelling might help to make healthier food choices, especially for seniors.

1.6.3. Legislation

The Commission Directive 2008/100/EC describes the legislation for nutrition labelling in the European countries. The RDAs, the energy conversion factors and definitions of fibre are described.

The vitamins and minerals, which are listed are allowed to be declared, with their RDA on the packaging. This list is included in Appendix IV. This list differs from the RDAs in Appendix I because the RDAs in Appendix I are specific to the target group. The list in Appendix IV is the average requirement.

1.6.4. Nutrition Claims

A claim mentions the benefits of a product. Below some claims are described, together with the product information. The complete list of nutrition claims can be found in Appendix V.

**Low fat claim**
A claim with low fat can be used if the product contains not more than 3g of fat per 100g.

**Fibres**
For fibres there are three different claims, all based on the amount of fibre in the product.
- **Source of fibre:** 3g/100g or 1.5g/100kcal or 1.5g/serving
- **High fibre:** 6g/100g or 3g/100kcal or 3g/serving
- **Enriched in fibre:** +25% compared to the standard product.

**Natural**
When a food naturally meets the condition(s) laid down in this Annex for the use of a nutritional claim, the term naturally/natural may be used as a prefix to the claim.
Research design

The following methods are used to answer the main question:

- Market research
- Interviews
- Product concept

2.1. Market research

The market research consists of two investigations:

2.1.1. Market research of trends

First, market research which was already available at Givaudan, was consulted. This market research, completed by Business Insights Ltd, gives information about the target group and understanding in the needs and trends that are specific for the target group. Market research is important to get a clear understanding in the needs of the consumers. With this understanding, the new product can be developed and positioned in the most beneficial way.

2.1.2. Market analysis of products

The second market research that I have carried out was the product research. The product research is carried out to get understanding of the products which are already available for the target group. For this research, the programme Mintel GNPD has been used. GNPD stands for Global New Products Database. This programme monitors product innovation and retail success in consumer packaged goods markets, worldwide. The product research gives information about the claims that are used for our target group. In addition, it gives information about the kind of products that are available for the baby boomers and if there is an interesting gap for this target group. This information could be helpful for giving a certain direction for the new product. This product research can be found in Appendix VI.

2.2. Interviews

To be certain if the trends that have been found in the market research really are the trends for the target group, some interviews have been performed. It was decided to do interviews because it then was possible to ask further, which gave a better view of the interests and habits of the target group. These interviews have been carried out to get more understanding about the snack moment(s) and snack style of the target group. The interviews were undertaken by Dutch males and females between age 50 and 65.

They received an email to ask if they would like to be interviewed. If they responded with a yes, an appointment was made with each person to interview them. 13 persons have been interviewed, of which 7 males and 6 females. The interview is enclosed in Appendix VII.
The product concept has been developed based on the product development process. The product concept development exists of the exploration phase, screening phase and concept development phase. Figure 1 is showing the flow chart of this development.

**Phase 1: Exploration**
The first step that has been undertaken was generating ideas for the new product concept by brainstorming. These ideas have been based on the trends that have been found in the market research and the interviews that have been undertaken by seniors. These product ideas can be found in Appendix VIII.

A Mindmap has been created to get a good visual overview of our target group. This Mindmap is enclosed in Appendix IX. This Mindmap has been made with the program Freemind and gives a good overview of the interests and needs of the target group. A Mindmap is helping to think more creative and to generate ideas.

Furthermore, a Moodboard has been created to get a better understanding of the wishes of the target group. This Moodboard can be found in Appendix X. The Mindmap as well as the Moodboard have been made based on the outcomes of the market research and the interviews.

**Phase 2: Screening**
All the product ideas that arose during brainstorming have been screened on technical feasibility and on the needs of the target group. The expectations of the consumers and the distinctiveness on the market have also been taken into consideration. Appendix XI shows this screening of the product ideas.

After evaluating all the different ideas, one concept has been chosen. This concept is based on a combination of the different product ideas.

**Phase 3: Concept development**
The chosen concept has been developed further. First the recipes have been created and the ingredients have been ordered. After ordering the ingredients it took about two weeks before all the products arrived. After receiving the products, each stick could be developed.

A description of these four experiments can be found under results. The sticks have been evaluated with a small group so the products could be optimised.

**Figure 1: Flowchart of the Product Concept Developing Process**
3.1. Market research results
The target group for the new product concept consist of seniors of 50-65 years. This group is also called the baby boomers because they were born during the population explosion after the Second World War and are now about 50 years or older. This group is mostly still working and active within social groups and events. They have a great sense of wellbeing and longevity. This group is very interested in their health and the key word of this group is vitality.

3.1.1. Market research of trends target group
The three dominant trends of this group are: health, convenience and indulgence.
They are very aware of eating healthily and know which food they should eat to stay healthy. They prefer natural ingredients which have a good taste: a good taste will encourage to repeat purchases.21
This group is not only interested in their internal health, but also in their external health. That is why they are interested in products for their look, like beauty, skincare, hair care, nail care and anti-ageing (overall appearance). They would like to stay good-looking and are trying to slow down or stop the ageing-process.

Needs target group
Looking at the needs of the baby boomers, they prefer products with specific characteristics. Examples of these characteristics are:

- Balanced and healthy products
- Easy to swallow products
- Resealable slider packaging
- Instant products: convenience

Seniors do not see themselves as an older population. They feel like they are a decade younger. They need a product that is not only focusing on their age. They need a product that is especially focusing on activity and vitality. The product has to contribute to an enjoyable moment, around 5 p.m., and has to be combined with a glass of wine or some other beverage.

3.1.2. Market analysis of products
The market analysis of products has been carried out to get more understanding about the products that are already available for seniors. It gives more understanding about products that are contributing to consumers’ health.
It furthermore mentions the snack habits of consumers and suggests a product positioning based on all these findings.

There are many products on the market which are good for consumers’ health. These products contain specific ingredients which contribute to a better health, like anti-oxidants, fibres and vitamins and minerals. They might be accompanied with a nutrition claim, to make consumers aware of the beneficial health effects. The more healthy products are sometimes combined with chocolate or caramel, to add some indulgence to the product.
Examples and characteristics of these products and claims are:

- Fruit drinks / Smoothies
- Margarine with added vitamin D and free from salt
- Products high in protein and/or fibre; like bars
- less fat / less than 10% fat
- low salt
- no added sugar, no artificial colours, flavours and preservatives

There are products on the market that contribute to better health for seniors. Examples of these products are products with added vitamin D and calcium for a good bone health or products with added fibres for a better bowel function. Examples of these products are shown in Appendix VI.
Many of these products have a claim on the label that says that the product is low in sugar or that the product contains added vitamins and/or minerals.

Unfortunately, there are not many products available for the baby boomers in Europe. There are many products for the younger people, however for the target group there are fewer specific products. The products which are available and that might be suitable for them have specific tags which are shown in Table 4.

Table 4: **Top 10 product tags on healthy food and drinks targeted at seniors, 2005-2007**

<table>
<thead>
<tr>
<th>Product tag</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Protein</td>
<td>4.5%</td>
<td>3.7%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Mature</td>
<td>10.4%</td>
<td>15.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>High Vitamins</td>
<td>13.4%</td>
<td>11.0%</td>
<td>9.3%</td>
</tr>
<tr>
<td>High Calcium</td>
<td>4.5%</td>
<td>6.1%</td>
<td>8.2%</td>
</tr>
<tr>
<td>High Fiber</td>
<td>6.0%</td>
<td>4.9%</td>
<td>8.2%</td>
</tr>
<tr>
<td>High Antioxidants</td>
<td>0.0%</td>
<td>1.2%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Natural</td>
<td>4.5%</td>
<td>3.7%</td>
<td>5.2%</td>
</tr>
<tr>
<td>High Amino Acids</td>
<td>1.5%</td>
<td>1.2%</td>
<td>4.1%</td>
</tr>
<tr>
<td>High Minerals</td>
<td>6.0%</td>
<td>4.9%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Instant</td>
<td>0.0%</td>
<td>1.2%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Note: Year ends 21st June 2007.

Source: Business Insights Ltd

High protein might be at the top of the list, because protein has a saturating function. This saturating function, of protein helps to maintain weight or aid weight loss. Baby boomers are the most likely group trying to lose weight. Products that promote 'weight-loss' will have great potential for this group. There are some misunderstandings about nutrition that might explain the use of high-protein products. 34% of the consumers think that calories from fat are the most likely to cause weight gain. This is probably based on the knowledge that fat is delivering 9kcal/g and protein is delivering 4kcal/g. A high fat content is therefore not wanted.

Looking at the flavours of the products for seniors, there are some specific flavours which are often used. These flavours are shown in Table 5. Some of these flavours, like blueberry and raspberry will be useful for the new product, although the list does not contain very many savoury flavours.

Table 5: **Top 10 flavours in healthy food and drinks targeted at seniors**

<table>
<thead>
<tr>
<th>Flavor</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>1.8%</td>
<td>5.0%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Milk</td>
<td>0.0%</td>
<td>2.5%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Blueberry</td>
<td>1.9%</td>
<td>0.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Kale</td>
<td>1.2%</td>
<td>0.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Parsley</td>
<td>1.8%</td>
<td>0.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Strawberry</td>
<td>3.6%</td>
<td>0.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Banana</td>
<td>0.0%</td>
<td>2.5%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Fruit</td>
<td>0.0%</td>
<td>2.5%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Raspberry</td>
<td>0.0%</td>
<td>2.5%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Angelica</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

Note: % = percentage in total healthy food and drinks for seniors launched.

Year ends June 21st 2007.

Source: Productscan Ltd, Business Insights Ltd
Looking at the food market, consumers make choices based on a debits-credits approach. This is shown in Figure 2, where these decisions are mentioned. During the day, they try to control their diet by eating healthily. As a reward for making healthy choices, they allow themselves to eat something which is less healthy. Control is a dietary decision with a health aspect; for Europeans this involves a diet or eating/drinking a smaller portion with fewer calories which is better for your health.

Compromise is a decision in taste/indulgence. When people are eating a snack which is not very healthy, the snack must at least be very tasty. The compromise-aspect is a treat for eating healthily earlier that day.

![Debits-credits approach of eating and drinking](image)

Figure 2: **Debits-credits approach of eating and drinking**

The products of the snack market can be positioned as shown in Figure 3. The savoury snack market consist of crackers, fruit & nuts, extruded snacks, pretzels, potato chips, biscuits, popcorn, tortilla and fried nuts. Figure 3 is showing the snack market and is showing if products are seen as 'better for you', 'emotional', 'unhealthy' or 'functional'.

![Mapping the snack market](image)

Figure 3: **Mapping the snack market**

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24 Figure 2 shows the debits-credits approach of eating and drinking.

25 Figure 3 represents the mapping of the snack market.
The new snack should fall between the categories ‘functional’ and ‘better for you’. An unhealthy snack will not fit within the target group, because the target group is very interested in their health. They are aware of the influence of an unhealthy lifestyle, because an unhealthy lifestyle influences their well-being in their future. The target group force to be less influenced by their emotional conditions, because they are aware of the effects of an unhealthy lifestyle and will therefore not overeat themselves.

3.1.3. Product positioning
The trends are showing that the baby boomers have a need for a product that is good for their health. The new product therefore has to contain a low amount of fat and has to contain natural ingredients, since they perceive to be healthy. The snack should not contain a high amount of calories and should fit in a healthy and active lifestyle.

Figure 4 shows the positioning of the product, based on the interviews and the trends from the market research.

![Baby boomers: 50-65 years](image)

- Vitality: internal and external health
- Functional
  - Low fat / Balancing weight / Weight conscious
  - Health, convenience, indulgence
- Small, tasty portions
- Sustainable and natural
- Savoury cravings
- Ethnic
- Image: 10 years younger
- Enjoyable moment: 5 or 10 p.m.
- Group moment

Figure 4: Product positioning targeting the baby boomers

Needs target group
The baby boomers have a need for a product that is low in fat. Low fat can be combined with a high amount of protein. Protein has a satisfying effect and can therefore help to eat less. This prevents overeating and overweight. The product should contain natural ingredients: they prefer real food without colourings and flavourings.

Enjoying moment
The snack should be suitable for consuming during the end of the afternoon. The snack should be convenient, and easy to prepare. The snack should be suitable for a relaxing moment at the end of the afternoon. Small portions are required because they do not want to overeat themselves. Because seniors are mostly snacking before dinner, the snack should be light and easy to eat.

Nutrition claim
The snack could contain a claim that is mentioning the benefit(s) of the product. A claim that will be suitable is a high fibre claim or a low fat claim. Mentioning that the product is very natural can as well be beneficial, because there is an interest in more natural products.
The baby boomers are a little bit sceptic about nutrition claims. They do not always believe the claims that are mentioned. They think the claims are a marketing trick instead of health improving aspect of the product. The packaging therefore should not contain too many claims. A high fibre or low fat claim is easy to check on the ingredients list and will therefore be an useful claims.

**Flavour**
Seniors enjoy savoury snacks at 5 p.m., so the new snack will be a savoury one. The flavours should be ethnic flavours because the target group likes to travel and try new dishes and new flavours. Also cheese flavours are preferred conform the trends and interviews. Cheese is often eaten with a glass of wine, or combined with toast. Also the cheese flavours of snacks that are already available in the market are popular among seniors.

**Trust**
Another very important aspect of the positioning of the product is the brand. A brand must have a trustworthy image as this can mean that claims might be sooner accepted and the product be purchased.

**Women**
Looking at the marketing, it could be a good opportunity to focus on women because it is the women in the target group are mostly doing grocery shopping. They decide what to buy and what to eat at home.

Based on the trends and the interviews that are accomplished, a snack should be:
- **Tasty**
- Less fat however not dry
- No dirty fingers
- Not too heavy on the stomach: (easy to eat)
- Enjoying with friends/family
- Large package, as well as portion packs (especially for women)
- Cheese flavour or ready salted (with black pepper), (plain flavours)
- Price: not too exclusive
- Natural appearance

**3.1.4. Concept statement**
The concept statement gives a description of the product concept about its goal and benefits and how it will fit in the baby boomers’ life.

**Opening**
You enjoy living a healthy life with friends and family. Travelling and experiencing new cultures and products have your interest. You find it important to stay vital and like to vary and find a balance in being active and having free time to relax.

**Promise**
This snack concept gives you the opportunity to snack in a more healthy way. The sticks are low in fat and high in fibre. Now you can enjoy snacking without feeling guilty. No preparation is needed; just open the package and enjoy the sticks together with friends or family.

**Proof**
The four savoury sticks provide an experience of different textures and cultures. The sticks are made of (whole), ancient grains, legumes, dried fruit and vegetables and combine snacking with health. The sticks are inspired by different countries like Japan, South-Africa, Italy and France. The packaging of the sticks consists of four compartments for the four different sticks. The packaging is resealable and can be found in the snack department of the supermarket.
This chapter reviews the information required by the interviews. The questionnaire can be found in Appendix VII: Interview.

Snacks and snack moments
To get more understanding about the snack moment and the type of snacks consumers of 50-65 years consume, respondents were asked when they have a need for a snack. Most of the seniors consume a snack after they come home from work, around 5p.m., or at the end of the evening. Most of the time, the snacks are combined with a beverage like wine or beer and sometimes with a glass of juice.

"When I come home from work I drink a glass of wine with something salty and light before dinner."  
"It is an enjoyable moment with my partner or children to relax after a hard day of working."

The snacks that are consumed are chips, (crispy) nuts, extruded snacks (cornuco®/chipito®), bitterballen©/cheese, raw vegetables or crackers with French cheese. A small bag of Snack-a-Jacks is especially enjoyed by women. Almost all of the snacks that are consumed are savoury snacks.

Reason for snacking
Seniors enjoy a snack because they have a need of something salty and light before having their dinner. They want something to satisfy their hunger. It is moreover a social moment with their partner or children. Most of the time, the snack is combined with a beverage, because a beverage is stimulating their appetite for a snack. Sometimes a snack is a kind of reward because they had a busy day at work.

"I like to treat myself with a snack because I worked hard."  
"When I am hungry I eat a snack because it is tasty."

They do not consume a snack on-the-go or at work; they eat their snack at home, on birthdays or among friends. Sweet snacks like chocolate or biscuits are eaten at work, especially in the morning (around 11 o'clock).

Characteristics of snacks
The target group likes snacks that are not too heavy on the stomach. They prefer light snacks which they can consume before dinner. The snack need to be very tasty, crispy and not too fatty. They are aware of the high fat content of some snacks: therefore they consume them in smaller amounts because of their health interest.

"A snacks needs to be salty, savoury and crispy, but in particular tasty!"

They especially like snacks that have a cheese flavour. A disadvantage of snacking is the messy fingers they get. They need pleasant snacking: no messy fingers, not too many calories, savoury and crispy and especially tasty!

A portion pack might be required, because then they do exactly know how much calories they have been eating. This is especially interesting for women. They will not get a guilty feeling when they consume the whole bag, because they know the damage is not too great.

"When you once start snacking, you continue eating."
The interview included some questions about the information on the label of products. As women do the grocery shopping most of the time, they more often read the information on the label than men. They look at the number of calories, carbohydrates, fat content, salt content, sweeteners, E-numbers and allergens.

Seniors do not see a nutrition claim as trustworthy; they do not believe them or buy products because they contain a nutrition claim. The label itself is more important to check the amount of calories, fat, carbohydrates, salt etc.

"I don't believe the health claims on the labels; it is a marketing trick."
"When I have to choose between a product with a logo or without a logo, I often choose the product with a logo."

Many packagings have a logo like Ik Kies Bewust-logo or Gezonde Keuze Klavertje from the Albert Heijn. When a similar product does not contain a logo, the target group will mostly choose for the product with a logo. However, they are a little bit sceptical about this and do not always believe a logo. They see it as a marketing trick. Therefore, the price and the brand are more important factors than the logo. This confirms the trend that a lower price might be required.

**Healthy snacking**

One of the most important questions in the questionnaire was if they have an interest in a healthier snack. Almost everyone had the same answer: only if it is tasty.

Taste is very important to them. They know snacking is not good for their health. When they do consume a snack, they want to do it well. They want to enjoy the snack(moment) and prefer eating less of a good product than eating a lot of a less tasty product. This confirms the information of the trends which has been found, that they prefer quality instead of quantity.

This is also confirms the debits-credits approach: consumers allow themselves to eat a snack as a reward for example working hard that day. The interviews showed that taste is the most important aspect of a snack. A tasty snack gives pleasure. A small, tasty snack will already be sufficient to satisfy their snack-needs.

"I am interested in a healthy snack, but not a light snack."
"A healthy snack must be tasty, otherwise I won't but it."

They will like a snack that contains less salt and less fat, although they will only like a snack when the flavour is good. Other health aspects will probably not influence their purchase intentions. Only if they are confronted with friends or family who are sick or have health problems will they look for products that are better for their health. For example, products that lower cholesterol or provide heart health. Products with claims about these health aspects will not activate purchase. The product itself is more important.

The baby boomers are consumers that will try new products. They will especially try products that are reduced in price or products which colleagues or family recommend. They do not only travel in Europe, but also go to see countries farther away. Therefore they will recognise flavours from around the world. They like flavours that are spicy, although most of them prefer a cheese- or salty flavour.
The product concept is developed in three phases: exploration, screening and concept development. These three phases are described below.

Exploration
The first phase of the snack concept development was the exploration phase. During this phase product ideas have been created based on the trends and needs that have been found during the market research and the interviews.

The trend research showed that there is a great interest in whole grains, natural products and super fruit. Therefore has been chosen to use ingredients that are fitting in these needs. With these ingredients some product concepts have been created.

The interviews have given information about the time the baby boomers snack (around 5 p.m.), the amount of snacks they eat (small portions) and what kind of snacks they eat (cheese, nuts, chips and snack-a-jacks). Also the enjoyable moment together with friends or family is playing an important role. A Mindmap has been created that makes the target group more visible.

A Moodboard is created to get a better understanding in the snack needs of the target group.

Screening
The product ideas that have been created during the exploration phase have been discussed. Brainstorming helps to make the ideas more concrete and to make sure the ideas were relevant to the needs and trends of the target group.

This screening has resulted in a product concept consisting four different sticks made with different technologies and with different (ethnic) flavours. This will result in different appearances and different textures of the sticks and will be suitable for a broader range of businesses.

The baby boomers as well as their children or friends can now choose their favourite stick and/or flavour.

The ingredients needed to have a health aspect or a taste influence as well as a good appearance. Therefore it was decided to use toasted grains or herb leaves on some sticks, or to add fibre to the products in different forms like using whole grains, dried fruit, inulin, Vitacel or linseed.

Fibres
To enhance the fibre content in a product, dietary fibres like inulin and Vitacel have been used. These fibres can be used in consideration of a possible fibre claim. Only small amounts are needed: 4-6g/100g of Vitacel to reach a total fibre content of 6g/100g. Another advantage of Vitacel is that it is gluten free and can be labelled as corn fibre instead of using an E-number.

Legumes
Also legumes have been used in the snack. Legumes have a fibre content of approximately 15g/100g and a high protein content of approximately 22%. Legumes have been used to make a protein-rich snack which also contribute some vital minerals like potassium and folic acid.

Nuts and seeds
Nuts and seeds are a rich source of some B vitamins and minerals. They can be used whole, but also in small pieces or ground. They mostly have a good oil composition with high amounts of unsaturated fatty acids.

Unfortunately, a disadvantage of using nuts, because of the presence of food allergens, is the possibility of cross-contamination in the factory.

This has to be taken in account before using nuts or seeds (sesame seeds) in the factory.
Dried fruit has been added to the snack to contribute to the vitamin C intake. It also fits with the trend of super fruit. Vegetables have been added to enhance the fibre amount of the snacks and the amount of vitamins and minerals. Vegetables also give an attractive colour to the sticks.

**Whole grains**
The usage of (ancient) whole grains is an upcoming trend. It is a healthy trend, because whole grains contain more fibres and micronutrients than processed grains. The use of quinoa, amaranth and other grains is therefore suitable for the snack to get an appropriate fibre and micronutrient amount.

**Flavours**
For Stick 1, the Pretstick, the Japanese Soy flavour has been used. Soy has a healthy image and falls in the trend of consuming ethnic meals.

Stick 2, the Chickstick, is flavoured with the African Chakalaka flavour, combined with coriander flakes. These coriander flakes give the sticks an interesting appearance. The Chakalaka flavour is based on a traditional African dish and suits the base for stick 2 well.

Stick 3, the Fitstick, is flavoured with the Italian Bruschetta flavour. This Bruschetta flavour goes well with the acidity of the goji-berries in the product. Bruschetta has also been chosen because tomatoes and herbs fall within the trends that have been found.

Stick 4, the Spinstick, is flavoured with the French Boursin flavour. Boursin is a traditional cream cheese with herbs that is often used by the seniors on crackers. It is also a kind of comparable product like the cornucods: also an extruded base, flavoured with a cheese flavour.

I have tried to find a balance with these flavours: the flavours will not be too strong or too spicy so that the flavours will not influence the taste of one another.

**Concept Development**
The following pages describe the experiments that have been undertaken to produce the four sticks and to optimise them.
Introduction and objective

Pretzels are normally made of soft wheat flour. Flour provides structure because of its protein and starch components. The gluten-containing proteins can form a gluten matrix which gives the dough its elasticity and structure. There are two types of gluten proteins: gliadin and glutenin. Gliadin gives sticky and fluid characteristics to the dough. Glutenin gives elastic characteristics to the dough by forming sulphur bonds within and between the protein chains. The starch gelatinises during baking and causes crumb formation.

Using sugar decreases the formation of a gluten matrix because sugar binds with water which the gluten then cannot easily take up.

Fat binds with the proteins and inhibits the formation of gluten. This results in a more flexible and better kneadable dough.

For the first stick, rice flour, oat flour and soy flour are used. Rice and soy flour do not contain gluten. Gluten is therefore added to the recipe to form a gluten matrix.

The expectation is to develop a pretzel-like stick, with a better nutritional value.

Materials

Table 6: Ingredients for stick 1: Pretstick

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Recipe 1</th>
<th>Recipe 2</th>
<th>Recipe 3</th>
<th>Recipe 4</th>
<th>Recipe 5</th>
<th>Recipe 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice flour</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Suprex</td>
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<tr>
<td>Oat flour</td>
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<td></td>
</tr>
<tr>
<td>Soy flour</td>
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<tr>
<td>Linseed</td>
<td></td>
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</tr>
<tr>
<td>Gluten</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortening</td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>Ammonium bicarbonate</td>
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</tr>
<tr>
<td>Yeast</td>
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</tr>
<tr>
<td>Malt</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn syrup</td>
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</tr>
<tr>
<td>Sodium bicarbonate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranth, popped</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double Coating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich soya seasoning flavour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flour

Rice flour, oat flour and soy flour are used instead of wheat flour to enhance the nutritional value of the product.

Linseed

Linseed is added because it is a source of omega 3 fatty acids and a source of fibre. (see Appendix III)

Yeast

The yeast ferments the sugars in the dough which gives the production of carbon dioxide gas. The gas is kept in the dough which gives an airy product. Dried yeast is used which can take up water more easily than fresh yeast and can produce more carbon dioxide. Dried yeast is also used instead of fresh yeast because of its storage stability.

Double Coating

Double Coating exists of malto dextrin, sugar, salt and yeast. Malto dextrins are syrups that contain less than 20% glucose and maltose and provide thickness and body.
Shortening

The shortening that is normally used is the Trio Bewust Puur Zacht and comes from CSM. It is a 100% vegetable fat and does not contain lactose or cow milk. Shortening gives stability to the air bubbles in the dough which creates a more airy product. Besides giving stability, the shortening can stick to the starch granules which gives a softer structure. During the trials, Royal Green Cooking Cream has been used. More about this coconut oil can be found in Appendix III.

Variations

The variations on the dough are described above in the table.

Variation 1: because of the low amount of gluten, pure gluten is added to form a gluten matrix.

Variation 2: Instead of yeast, sodium bicarbonate is added to provide air in the product.

Procedure

1. Pre-heat two ovens to 240°C and 130°C.
2. Add dry ingredients to the mixing bowl of the Hobart mixer. Mix on low speed for 60 seconds, or until well mixed.
3. Heat the shortening for about 30 seconds in the microwave to make it fluid and add it to the dry ingredients. Mix for 30 seconds.
4. Mix the yeast, malt, corn syrup and sodium bicarbonate with the water to dissolve. (Or mix the ammonium bicarbonate, corn syrup and sodium bicarbonate with the water.)
   Add wet ingredients slowly whilst mixing on low speed. Mix on low speed for 60 seconds or until dough has come together. Add more water if necessary to form the dough.
5. Mix on high speed for 90 seconds. The dough is ready for rolling out when it is extensible and the gluten has formed. You should be able to pull the dough apart without breaking in two pieces. The dough should not be sticky or stiff. You should not need additional flour to roll the dough out with.
6. Put the dough in a plastic bag and put it in the proofer for half an hour. (When using ammonium bicarbonate, skip this step).
7. Roll out some of the dough to approx 0.5cm thickness.
8. Using a sharp knife, cut the dough into even strips approx 0.75cm wide by 20cm long.
9. Dip the strips in a Lye solution. Use some plastic gloves to prevent irritation.
10. Place the strips onto a non-stick baking tray with space left between each strip.
11. Place the tray into the hot oven for 4 minutes. Remove, and place into the second oven of 130°C for approx 35 minutes. The pretzels are ready when the texture is crunchy and no longer soft.
12. Prepare the Double Coating (DC) by heating the DC in water until it is dissolved. Add the flavouring through the mix.
13. Cover the sticks with the mix with a plastic brush and dip them into the popped amaranth, which has been popped in a hot dry pan.
14. Dry the sticks for 15 minutes in an oven of 80°C.

Results

The first sticks did not have a crunchy structure because of the absence of gluten. Therefore, in the second recipe, gluten was added and also water, because the gluten matrix is taking up water. As the second recipe also did not give the desirable crunchiness, we tried to roll out the dough again to create more layers in the dough. The expectation was to bring more air in the product. Unfortunately, instead of keeping the air in the dough, the air was pushed out of the dough because of the pressure. The gluten had not been able to keep the air in the dough. Also the low fat content prevented keeping the air in the dough. This resulted in a less crunchy texture.

To bring more air in the product, we tried out recipe 3 and 4. Recipe 4 is prepared with ammonium bicarbonate. When ammonium bicarbonate is heated until 60°C, it breaks down into CO₂ and ammonium. The ammonium escapes during baking so the pretzels will not retain the
After baking, the dough with ammonium bicarbonate does not need to go in the proofer to rise.

The result of recipe 4 was a crunchier pretzel that contained more air.
Lastly recipe 5 and 6 have been prepared which both contain more gluten. Recipe 6 gave a better result because of the use of ammonium bicarbonate.

To make the pretzels more attractive, amaranth has been popped in a dry pan. Double Coating (DC) is prepared including a Japanese Soy Sauce flavour. The DC is spread on the sticks, dipped in the amaranth and dried in the oven. The result is a beautiful contrast of brown and white.

**Nutritional information**
The pretzels were analysed to obtain more nutritional information and to see in which category (A, B or C) the snack falls. (For criteria, see Table 3). This analysis can be found in the product specification in Appendix XIII. The values are an estimation and not validated.

The pretzel falls in snack category B because it contains:

<table>
<thead>
<tr>
<th>Analysis</th>
<th>B-Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy: 98 kcal/portion</td>
<td>Energy ≤ 110 kcal/portion</td>
</tr>
<tr>
<td>SF: 9.2E%</td>
<td>SF ≤ 13E%</td>
</tr>
<tr>
<td>TF: 0E%</td>
<td>TF ≤ 1.3E%</td>
</tr>
<tr>
<td>Na: 602 mg/100g</td>
<td>Na ≤ 400 mg/100g</td>
</tr>
</tbody>
</table>

The sodium content is too high to fall in the B category. There has been used a flavour that is not sodium-reduced. Using a low sodium flavour will lower the sodium content which let the snack fall in the B category.

Based on the nutritional results, the following claims can be used on the packaging:
- High fibre (>6g fibre/100g)
- High protein (Protein >20E%)
Introduction and objective
The second stick is a sheeted stick. It is made of legumes like chickpeas, red beans and lentils. The chickpeas first have been soaked for one night in water and then cooked for one hour. Then the chickpeas have been blended and cooled down. The chickpeas need a long cooking time, because the seed coat does not absorb the water. Only after the seed coat is saturated with water does it expand and water can enter the pea. After cooking, the starch granules have become soft. They become part of a network where water is retained. A quite dry texture is formed which can be blended.

Sheeting gives pressure and movement which changes the structure of the dough. The protein network is broken down and mixed with the starch granules. The expectation is to develop a crunchy stick which is protein rich and low in fat.

Materials
Table 7: Ingredients for stick 2: Chickstick

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Recipe 1</th>
<th>Recipe 2</th>
<th>Recipe 3</th>
<th>Recipe 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chick peas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red beans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lentils, precooked</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pea isolate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remyflo C200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAKA-SNAK®</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advil PGE 1420</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato juice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemon juice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste &amp; Bite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat enhacement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legumes
The chick peas, red beans and lentils are added because these are all legumes. Legumes are added because they are a rich source of protein, fibre and minerals. Precooked lentils are added because the dough needs a cold swelling to provide a starch network which gives structure to the dough.

Pea isolate
Pea isolate is added to make the stick a protein-rich stick. More protein is providing satiety and is associated with weight loss.

BAKA-SNAK®
BAKA-SNAK® is a pregelatinized, modified food starch on a waxy maize basis. It is a texturising agent that is produced by National Starch.

Remyflo C200
Remyflo C200 is a fibre enriched rice flour produced by BENEO. Remyflo is a texturizer made of rice flour and is used to give a good texture to the product.
**Admul PGE 1420**  Admul PGE 1420 is a polyglycerol ester of vegetable fatty acids, produced by Kerry. It is an aerating agent that improves volume and crumb texture. Admul PGE 1420 makes it possible to lower the fat content without losing its quality characteristics. Admul PGE 1420 is especially added to provide sheetability.

**Tomato juice**  Tomato juice is added instead of water to give more nutritional value to the product.

**Variations**
The variations in the dough are described above.

Variation 1: texture. A recipe with BAKA-SNAK® has been compared with a recipe with Remyflo.

Variation 2: temperature. Using a high temperature will generate steam in the product. The air will expand in the product which will make the dough rise which gives a hollow stick. This is called soufflé.²⁷

**Procedure**

1. Pre-heat two ovens to 200°C and 75°C.
2. Add dry ingredients to the mixing bowl of the Hobart mixer. Mix on low speed for 60 seconds, or until well mixed.
3. Add wet ingredients slowly whilst mixing on low speed. Mix on low speed for 60 seconds or until dough has come together.
4. Mix on high speed for 90 seconds.
5. Sheet the dough to approx 0.5cm thickness. Sheet the dough 5-7 times until a nice sheet has come together.
6. Using a sharp knife, cut the dough into even strips approx 0.75cm wide by 20cm long.
7. Place the strips onto a non-stick baking tray with space left between each strip.
8. Place the tray into the hot oven for 4 minutes. Remove, and place into the second oven of 75°C for approx 20 minutes. The sticks are ready when the texture is crunchy and no longer soft.

**Results**
During the first trial, we made circles of the dough instead of sticks. These circles have been fried in a fryer at 180°C for about 10-15 seconds. The dough circles puffed, because the water within the circles turned into steam. The circles soaked up a lot of oil. The result was a very thin and oily product that broke quickly. Frying was therefore not a good option and had also a negative aspect because it contributed to a high oil content. Therefore the circles have been baked in the oven for 5 minutes on 180°C.

Using the BAKA-SNAK® gave a better, crunchier result than the sticks that had been made with Remyflo.

Recipe 3 had a higher amount of BAKA-SNAK®, to improve texture. Less water was added to increase the puffing effect in the oven. The dough was sheeted seven times and then cut into small sticks. The sticks were baked in the oven for 5 minutes at 180°C.

The sticks were not very airy. Therefore, the temperature was raised to 225°C because we expected that this should result in a more hollow stick. The sticks were baked for 3 minutes at 225°C, which indeed gave a more hollow result. Unfortunately, this recipe gave a little bit a native starch feeling in the mouth. Therefore recipe 4 was made which contained more water to solve the starch problem.
The sticks from recipe 4 were first baked for 3 minutes in the oven at 225˚C and then dried for half an hour in an oven at 75˚C. This resulted in a hollow, crispy stick. As the sticks had a bitter aftertaste, some lemon juice was added to the stick. This masked the bitter taste; or at least, the bitter taste came through later than before. Also some taste & bite flavour ingredient is added to the stick and some fat enhancement. This gave a better mouth feel and a more bread-like taste. The sticks broke very soon after they were dried. Therefore, the sheets have been made thicker and the sticks have been baked in an oven of 200˚C for four minutes and dried for 20 minutes in an oven of 75˚C. This gave a hollow, less fragile stick.

At the end, the sticks were flavoured with the African Chakalaka flavour, which is a traditional dish in Africa. This flavour is mixed with some Coriander leaves which gave a nice appearance.

Nutritional information
The sticks were analysed to obtain more nutritional information and to see in which category (A, B or C) the snack falls. (For criteria, see Table 3). This analysis can be found in the product specification in Appendix XIII. The values are an estimation and not validated.

The stick falls in snack category B because it contains:

<table>
<thead>
<tr>
<th>Analysis</th>
<th>B-Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy: 76kcal/portion</td>
<td>Energy ≤110 kcal/portion</td>
</tr>
<tr>
<td>SF: 3E%</td>
<td>SF ≤13E%</td>
</tr>
<tr>
<td>TF: 0E%</td>
<td>TF ≤13E%</td>
</tr>
<tr>
<td>Na: 1640mg/100g</td>
<td>Na ≤400mg/100g</td>
</tr>
</tbody>
</table>

The sodium content is too high to fall in the B category. There might have been made a mistake by analysing the product, because this sodium content is much too high. Using less flavour and/or a sodium-reduced flavour will lower the amount of sodium in the product. It is also possible to lower the salt content in the base. Practical experiments showed no changes on texture or expansion. Therefore, lowering the salt content in the base might be very sufficient.

Based on the nutritional results, the following claim can be used on the packaging:

- High protein (Protein >20E%)
Introduction and objective

Stick 3 is based on roasted or popped grains, dried fruits and nuts. It is a compressed stick with the characteristics of a muesli bar. The goal of this product is to develop a stick with a high amount of fibre. Therefore, Orafti®Synergy1 is added to increase the fibre content.

The ingredients are held together by a mixture of water, Double Coating, Orafti®Synergy1 and sorbitol. These ingredients are heated until they are dissolved.

Materials

Table 8: Ingredients for stick 3: Fitstick

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Recipe 1</th>
<th>Recipe 2</th>
<th>Recipe 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelt, roasted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat bran</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustagrain® Contined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranth, popped</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almond</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goji-berry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pecan nuts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double Coating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orafti®Synergy1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorbitol</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Roasted spelt, Sustagrain®

The roasted spelt and the Sustagrain® are both delivered by Contined. Both of the grains are added because of their natural appearance and their good taste. Sustagrain® is a grain with a high fibre content of 30%. Spelt is added because of its authenticity.

Amaranth

The amaranth is delivered by Meneba. It is popped in a dry pan and gives a nice mouth feel because of its fine structure.

Dried fruit

The dried fruits are added because of their vitamin C content and to add fruit to the product. Dried fruits furthermore contribute to the fibre content of the product. The goji-berry also fits in with the trend of superfruits and ethnicity.

Nuts

The nuts are added because of their rich mineral content and their contribution of a rich, nutty flavour.

Orafti®Synergy1

Orafti®Synergy1 is a product from BENE0. It is an enriched chicory inulin powder that contains: inulin, oligofructose, fructose, glucose and sucrose.

Clinical research shows that 8g of Orafti®Synergy1 increases the calcium uptake in humans. It might therefore be a good ingredient for our target group because they might suffer of osteoporosis. The sticks contain less than 8g of Orafti®Synergy1 and therefore do not deliver the full amount that is required to enhance the calcium uptake. Nevertheless, when other products also contain this ingredient, the total...
Sorbitol is used because it has a function as humectant. A humectant is added because it retains the moisture in food and prevents dehydration. When the bars are dried in the oven, they will not become too dry because of the sorbitol.\(^8\)

**Variations**

The variations are described above. The combinations of the grains are similar and only the kind of dried fruit and nuts have been changed. To the binder, some water and DC is added, because the amount of binder was not sufficient to form a mixture.

**Procedure**

1. Pre-heat one oven at 80\(^{\circ}\)C.
2. Weigh all the dry ingredients and mix them together well.
3. For the binder, mix the water, DC, Orafti® Synergy1 and sorbitol and heat until all the DC is dissolved.
4. Mix the binder with the dry ingredients and put the resulting mixture onto a baking tray covered with greaseproof paper. Press firmly.
5. Put the trays in the oven for about 30 minutes to dry and harden the mix then let it cool down.
6. Cut the finished product into sticks and flavour them.

**Results**

The dry ingredients were first mixed together. After adding the binder, it appeared that the dry ingredients did not stick well together. Therefore, more DC was dissolved in water and added to the ingredients. This resulted in a more sticky mix. This was put into the trays and dried in the oven. After they were dried, they were allowed to cool down. It then seemed that the bars were still too soft. Therefore, the sticks were baked for another 30 minutes to dry further.

The usage of sorbitol might be the reason of this longer drying time, because it retains water.

The plate is cut, after it had cooled down, into small sticks of 0.6cm. The sticks with the goji-berries were flavoured with an Italian Bruschetta flavour and the sticks with the plums were flavoured with an Italian hard cheese flavour.

**Nutritional information**

The sticks were analysed to obtain more nutritional information and to see in which category (A, B or C) the snack falls. (For criteria, see Table 3). This analysis can be found in the product specification in Appendix XIII. The values are an estimate and not validated.

The stick falls in snack category B because it contains:

<table>
<thead>
<tr>
<th>Analysis</th>
<th>B-Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy: 89kcal/portion</td>
<td>Energy Ö110 kcal/portion</td>
</tr>
<tr>
<td>SF: 4.6E%</td>
<td>SF Ö13E%</td>
</tr>
<tr>
<td>TF: 0E%</td>
<td>TF Ö1.3E%</td>
</tr>
<tr>
<td>Na: 578mg/100g</td>
<td>Na Ö400mg/100g</td>
</tr>
</tbody>
</table>

After flavouring the product will contain about 578mg sodium which will still be too high to fall in the B category. Using less of the flavour or a sodium reduced flavour might help to reach a content of Ö400mg/100g.

Based on the nutritional results, the following claim can be used on the packaging:

- High fibre (>6g fibre/100g)
3.4.4. Product concept stick 4: Spinstick

Introduction and objective
The fourth stick is made with the extruder. The target of this fourth stick was to develop a snack with high fibre content and a crispy texture. Therefore, Vitacel has been added to the mixture. Extrusion is a process in which a food material is forced to flow, under one or more of a variety of conditions of mixing, heating, and shear, through a specially shaped die. Due to the rapidly expanding gasses at the die opening, the extruded piece can expand greatly.

Materials

Table 9: Ingredients for stick 4: Spinstick

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Recipe 1</th>
<th>Recipe 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RemyLiVe®</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maisgits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tapiocagrits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rye flour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Vegetable Blend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitacel Corn Fibre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RemyLiVe® is a product from BENEO that consists of the rice bran and germ. It is a source of dietary fibre, anti-oxidants, vitamins and minerals. RemyLiVe® gives a sweet, nutty flavour to a product.

Spinach
The spinach that has been used is frozen leaf spinach. It has been used to add vegetables to the product and to give a contribution of the moisture content in the mix.

Red Vegetable blend
The red vegetable blend consists of the following ingredients: tomato paste, crushed tomato paste, dehydrated onion and carrot, ascorbic acid (E300) and Tocopherols (E306) (added as antioxidants). It is added to enhance the vegetable content and because it gives a good combination with the spinach and garlic.

Vitacel
Vitacel is a corn fibre from J. Rettenmaier Benelux which can enrich the fibre content of a product. It is an insoluble fibre that provides texture and can enhance the shelf life. Vitacel also has liquid- and fat-binding abilities and can make the extruded product smoother. As Vitacel is an insoluble fibre, it enlarges the volume in the intestine and improves the rapidity of the movement of the mass.

Variation
The first recipe seemed to have a high fat content during extrusion. Therefore some tapioca grits have been added to give a better flow through the machine and to give a more constant output. How many tapioca grits were added is unsure.
1. Defrost the frozen leaf spinach and blend it in the food processor to crush it.
2. Mix the ingredients together with the spinach in a Stephan Maxine to spread the spinach through the mix.
3. Start the extruder with the following process conditions: speed: 450rpm, feed rate: 20kg/h, water feed: 14%, pressure: 35 bar and barrel temperatures of 30°C, 60°C, 90°C, 110°C, 135°C and 160°C.
4. Cut the extrudates with a sharp knife as they emerge from the die, about 16cm long.
5. Flavour the sticks.

Results
During the extrusion process, the output of the machine was not very constant. Therefore tapioca grits were added to let the mix flow more constantly through the machine.
The sticks that now came out of the extruder were more equal and had a smoother surface.
The sticks were flavoured with a French Boursin flavour that combines well with the taste of spinach in the product.

Nutritional information
The sticks were analysed to obtain more nutritional information and to see in which category (A, B or C) the snack falls. (For criteria, see Table 3). This analysis can be found in the product specification in Appendix XIII. The values are an estimation and not validated.

The stick falls in snack category B because it contains:
SF: 9.7E% SF ≤13E%
TF: 0E% TF ≤1,3E%
Na: 540mg/100g Na ≤400mg/100g

Like other sticks, this stick contains a high amount of sodium. A lower salt content in the base could be tried as this will have a high impact on the sodium level. Lowering the salt content could have an impact on the texture, but this is not to be expected.

Based on the nutritional results, the following claim can be used on the packaging:
- High fibre (>6g fibre/100g)
4.1. Market research
Market research has been undertaken to get an overview of the trends the target group are facing. The trends that have been found were helping to create a new product. Note that there has to be kept in mind that these trends need to be reanalyzed from time to time to keep them expressing the actual situation. When the product is developed further and finally comes onto the market, it is possible that the trends will be old-fashioned. On the other hand, responding to these trends by developing a new snack can exploit a new market with great potential.

The market analysis of products has given a better understanding of the products that are available for the target group. Market research is always a good start when considering launching a new product or new product ideas. The market research showed some products with many nutrition claims on the packaging. Interviews however showed that too many claims on a product are not preferred by the baby boomers. They are sceptical about all those claims and do not really trust such products. We therefore always have to bear in mind the often varying characteristics of the research results.

The snack concept is positioned for the baby boomers of 50-65 years. It might be possible that the snack concept will not only interest them, but also other consumers who have interest in their health. Therefore it is recommended to focus not only on the seniors, but maybe also on the younger consumers to get a higher profit. This is in line with the results that have been found during the market research that seniors feel like they are a decade younger. However, it is first necessary to test if the baby boomers will still be interested in a product if it is positioned for a younger target group.

The snack concept is based on a low fat and high fibre concept to provide a healthy lifestyle. Based on the research, it seems that the majority of the target group is interested in a low fat, high fibre product. However, there will always be a group who prefer an unhealthy snack, even though they are conscious about the fact that snacking is not good for their health.

4.2. Interviews
The interviews gave a better picture of the snack needs of the target group. It was unclear when the target group enjoyed a snack and how much they ate, so it was therefore important to get a better understanding of this. The expectation was that the target group would eat a snack together with friends or family, combined with a beverage. The interviews confirmed these expectations and gave further information about their snack habits.

The interviews were all carried out by one person, which gives a stable result, and 13 persons were involved. This is not a high number which may mean that the results might be less reliable and valuable.

Only Dutch persons have been interviewed. The results can therefore not be generalised and can not be used for other European countries. Other countries might have other snack moments and snack desires. More interviews need to be undertaken in other countries to get a better comprehension of the snack moments and desires of other European regions.

The interview consisted of open questions. Therefore, it was not possible to do any statistical test. However, it has been beneficial to use open questions because it now was possible to ask further to get a better picture of the needs of the target group.

The respondents were asked if they were interested in a nutritional snack. The Opinions were divided and also the requirements (tasty, advantage health aspects) were different. A report from LNV consumentenplatform confirms that the target group is not homogenous and that they are interested in tasty products. The target group needs to understand the advantageous health aspects; then they will be interested in the product and purchase it. It is therefore recommended to explain the health aspects of the product.
The product concept has been developed following the product development process of Earle and Earle. The process consists of three phases; exploration, screening and concept development.

- The exploration phase has given product ideas, based on the trends and interviews. The product ideas are also based on the visual overview of the Mindmap and the Moodboard.
- These product ideas have been discussed. During the screening phase, one concept was chosen. A disadvantage of this process, is that evaluation of the product concept with a focus group could not be carried out. It is usually the manufacturer of the final product who carries out a focus group evaluation. For a business-to-business company, such an evaluation does not produce sufficient information to justify the high costs.
- During the concept development phase, we started to develop the sticks, not knowing if the target group would be interested in this concept. This is a restriction and it is therefore recommended to evaluate the concepts with the target group to optimise the sticks and make them suitable for them.

For each stick, a recipe was created and ingredients ordered so that the development could start. The expectation was to develop nutritional snacks (sticks) that would have a good texture and that were also tasty. The sticks should also have a good appearance. During the experiments, some steps were undertaken to ensure the sticks have all these characteristics. In order to make the sticks tasty, oil had to be added to make the flavour adhere to the sticks. This is a disadvantage because it raises the energy content of the sticks and gives them a higher fat content. On the other hand, the target group mentioned in the interviews that a snack has to be tasty. This was their most important aspect for a snack and might be more important than the fat content. This is an important point to evaluate with the target group.

Another consequence of creating flavoursome sticks is the high sodium content. The flavours that have been used are high in sodium, which raises the total sodium content of the products. A result of this high sodium content is that the products do not fall in the B category. A high sodium content is also not desired because of its health aspect (high blood pressure). It is therefore recommended to use low sodium flavours to lower the sodium content. Lowering the salt content in the base could also be a good option. Although this might influence the expansion and texture of the products, practical experience indicates that this is not to be expected. More tests need to be done to optimise sodium content to reach the snack criteria of the Dutch Health Council.

Almost all of the ingredients that are used for the sticks have health aspects. This is in line with the target to develop a nutritional snack. A disadvantage of these ingredients is the price; they are often more expensive than the regular ingredients. The ordered samples for the sticks were free; therefore it is hard to determine a reliable price. It is therefore recommended to look at the price of the ingredients and to make a determination of the costs. The target group mentioned in the interviews that they were willing to pay more for a good product. They also mentioned that a product that is too exclusive and expensive will not be bought regularly. Therefore, the price should be taken into account during consumer research to optimize the product characteristics.
Taking into account the restrictions that have been mentioned in the discussion, the following recommendations can be made. These recommendations can be carried out by Givaudan or by the company that will develop the sticks further.

- **Product concept**
  The product concept is based on ingredients that contribute to health. It is recommended to stay up to date of new ingredients and technologies to optimise the snack concept with promising, improved ingredients. The product concept is very flexible and can be changed in many ways:

  - **Texture:**
    The in-dough flavours can be changed to give the base other (texture) characteristics. A fat-enhancer and a taste & bite flavour has now been used. These flavours give a more fatty mouth feel and a bread flavour to the sticks. Other in-dough flavours can be tried to optimise the sticks.

  - **Flavour:**
    The four sticks are now flavoured with flavours that have been chosen because they are a good match with the taste of the base. These flavours give the specific ethnic taste to the sticks. By using other flavours, it will be possible to create a different mix of experiences. Using flavours that are sodium-reduced is also recommended. These flavours will reduce the total sodium content and allow the sticks to fall in the B category of the snacks criteria.

  - **Variation in portion (size / packaging / form):**
    The chosen snack concept consists of four different sticks. The shape of the snack can be changed for example in a round form in different sizes. It is also possible to change the packaging to portion-packs. It is recommended to test these variations with the target group during consumer research to understand if these aspects will be profitable.

- **Interview target group in other countries**
  By interviewing the target group in other countries, more information can be obtained about the snack moment and snack needs of the baby boomers. This information can be helpful by positioning the product concept in other countries.

- **Carry out consumer research**
  By carrying out consumer research, more information about the opinion of the target group about the product concept can be obtained. More information about which texture, flavour and the concept as a whole can be useful by further development of the product concept.

- **Make a cost determination**
  By making a cost determination, more insight will be gained about the cost price of the product and the price of the final product in the super market. This price can be evaluated by the target group to understand if the price is too high or low. Eventually, other ingredients that might have the same nutritional aspect but a lower cost could be chosen.

- **Following the product development process**
  It is recommended to follow the product development process so there can be worked systematically. This will prevent missing important steps in the development process and will generate new ideas for developing the product concept further. This process will also help to position the product in a beneficial way to make the launch profitable.
During this investigation, a snack concept has been developed consisting four nutritional sticks. Different product ideas have first been conceived based on the trends and (nutritional) needs that were found by the market research and the interviews. These product ideas have been screened and a concept has been chosen. This concept, consisting of four different sticks, has been developed and processed by different techniques and tested on texture and appearance. Nutritional analyses were conducted to evaluate the nutritional aspects of the sticks. This has given a result of sticks that are high in fibre, high in protein but also high in salt. This high salt content is not desired but can easily be adapted by lowering the salt content in the base or using sodium-reduced flavours. With a lower sodium content, it will be possible to achieve the B category of the snack criteria of the Dutch Health Council. The foundation of the high fibre and protein characteristics are provided by the ingredients that have been used like fibres, legumes, nuts and seeds, dried fruit and vegetables and whole grains.

With the four different flavours, we would like to contribute to the ethnic and taste wishes of the target group. Therefore the flavours Japanese Soy, French Boursin, Italian Bruschetta and African Chakalaka have been chosen. These four tasty sticks might have a great potential to both attract consumers and give health benefits.
Table A: European dietary reference values for nutrient intakes completed with the Dutch dietary reference intakes.\(^1\)\(^2\)

<table>
<thead>
<tr>
<th>Macro-nutrients</th>
<th>Males 51-70yr</th>
<th>Females 51-70yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AI/RDA/EER</td>
<td>AI/RDA/EER</td>
</tr>
<tr>
<td>Water</td>
<td>L/day</td>
<td>2.5</td>
</tr>
<tr>
<td>Energy</td>
<td>MJ/day</td>
<td>9</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>E%</td>
<td>45-60</td>
</tr>
<tr>
<td>Total Fibre</td>
<td>g/day</td>
<td>25</td>
</tr>
<tr>
<td>Total fat</td>
<td>E%</td>
<td>20-36</td>
</tr>
<tr>
<td>m.u.f.a. + p.u.f.a.</td>
<td>E%</td>
<td>8-36</td>
</tr>
<tr>
<td>p.u.f.a.</td>
<td>E%</td>
<td>12</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>E%</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Trans</td>
<td>E%</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Linoleic acid</td>
<td>E%</td>
<td>4</td>
</tr>
<tr>
<td>Alpha-linolenic acid (ALA)</td>
<td>E%</td>
<td>0.5</td>
</tr>
<tr>
<td>EPA+DHA</td>
<td>g/day</td>
<td>0.25</td>
</tr>
<tr>
<td>Protein</td>
<td>E%</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>g/day</td>
<td>60</td>
</tr>
</tbody>
</table>

E% = Percentage of the total energy intake  
AI = Adequate Intake  
RDA = Recommended Dietary Allowances  
EER = Estimated Energy Requirements

Table B: RDA, AI, and UL of Vitamins for Dutch males and females of 51-70 years.\(^3\)

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Males (51-70yr)</th>
<th>Females (51-70yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RDA / AI</td>
<td>RDA / AI</td>
</tr>
<tr>
<td>Vitamin B1 (Thiamin)</td>
<td>mg/day</td>
<td>1.1</td>
</tr>
<tr>
<td>Vitamin B2 (Riboflavin)</td>
<td>mg/day</td>
<td>1.5</td>
</tr>
<tr>
<td>Vitamin B3 (Niacin)</td>
<td>mg/day</td>
<td>17</td>
</tr>
<tr>
<td>Vitamin B5 (Pantothenic acid)</td>
<td>mg/day</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin B6 (Pyridoxine)</td>
<td>mg/day</td>
<td>1.8</td>
</tr>
<tr>
<td>Folate</td>
<td>µg/day</td>
<td>300</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>µg/day</td>
<td>2.8</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>mg/day</td>
<td>70</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>µg/day</td>
<td>1000</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>µg/day</td>
<td>5-10</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>mg/day</td>
<td>10.7</td>
</tr>
</tbody>
</table>

RDA = Recommended Dietary Allowances  
AI = Adequate Intakes  
UL = Tolerable Upper Intake Levels

\(^2\) EFSA sets European dietary reference values for nutrient intakes.  
\(^3\) Vitamines en mineralen.  
Table C: RDA, AI and UL for Minerals for Dutch males and females of 51-70 years.3

<table>
<thead>
<tr>
<th>Minerals</th>
<th>Males (51-70yr)</th>
<th>Females (51-70yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RDA / AI</td>
<td>RDA / AI</td>
</tr>
<tr>
<td>Calcium</td>
<td>g/day</td>
<td>1.1</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg/day</td>
<td>700-1400</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg/day</td>
<td>300-360</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/day</td>
<td>9</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/day</td>
<td>10</td>
</tr>
<tr>
<td>Iodine</td>
<td>µg/day</td>
<td>150-300</td>
</tr>
<tr>
<td>Selenium</td>
<td>µg/day</td>
<td>60-160</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/day</td>
<td>1.5-3.5</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/day</td>
<td>-</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/day</td>
<td>-</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>µg/day</td>
<td>-</td>
</tr>
</tbody>
</table>

RDA = Recommended Dietary Allowances
AI = Adequate Intakes
UL = Tolerable Upper Intake Levels

Table D: Amino acid requirements for males and females of 50-65 years

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Adults (18+ yr)</th>
<th>Males 50-65yr</th>
<th>Females 50-65yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mg/kg/day</td>
<td>mg/g protein</td>
<td>Mean weight: 81.7kg</td>
</tr>
<tr>
<td>Histidine</td>
<td>8-10</td>
<td>16 mg</td>
<td>735.3</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>10</td>
<td>13 mg</td>
<td>817</td>
</tr>
<tr>
<td>Leucine</td>
<td>14</td>
<td>19 mg</td>
<td>1143.3</td>
</tr>
<tr>
<td>Lysine</td>
<td>12</td>
<td>16 mg</td>
<td>980.4</td>
</tr>
<tr>
<td>Methionine and cysteine</td>
<td>13</td>
<td>17 mg</td>
<td>1062.1</td>
</tr>
<tr>
<td>Phenylalanine and tyrosine</td>
<td>14</td>
<td>19 mg</td>
<td>1143.3</td>
</tr>
<tr>
<td>Threonine</td>
<td>7</td>
<td>9 mg</td>
<td>571.9</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>3</td>
<td>5 mg</td>
<td>285.95</td>
</tr>
<tr>
<td>Valine</td>
<td>10</td>
<td>13 mg</td>
<td>817</td>
</tr>
<tr>
<td>Total (except for histidine)</td>
<td>64</td>
<td>113 mg</td>
<td>6062.9</td>
</tr>
</tbody>
</table>

a. From tables 4 and 39 in FAO/WHO/UNU [9].
b. Also based on a summary by Williams et al. [10].
c. Sulphur amino acids
Appendix II: Food Consumption Survey (FCS)

Table E: Average of the observed intake of macro-nutrients of the third FCS (1997/1998) and the RDA or AI of Dutch males and females of 51 - 70 years.

<table>
<thead>
<tr>
<th>Macro-nutrients</th>
<th>Males 51-70yr</th>
<th>Females 51-70yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>L/day</td>
<td>2</td>
</tr>
<tr>
<td>Energy</td>
<td>MJ/day</td>
<td>10.4</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>E%</td>
<td>45-60</td>
</tr>
<tr>
<td>Total Fibre</td>
<td>g/day</td>
<td>25</td>
</tr>
<tr>
<td>Total fat</td>
<td>E%</td>
<td>20-35</td>
</tr>
<tr>
<td>P.u.f.a</td>
<td>E%</td>
<td>12</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>E%</td>
<td>10</td>
</tr>
<tr>
<td>Linoleic acid</td>
<td>E%</td>
<td>6.1</td>
</tr>
<tr>
<td>Protein</td>
<td>E%</td>
<td>15.6</td>
</tr>
<tr>
<td>Salt</td>
<td>g/day</td>
<td>60</td>
</tr>
</tbody>
</table>

The red numbers are showing the intakes which are higher than the recommendations. Except for the energy intake for women: there the caloric intake is a little bit too low.

Table F: Average of the observed intake of micro-nutrients of the third FCS (1997/1998) and the RDA or AI of Dutch males and females of 50 - 65 years.

<table>
<thead>
<tr>
<th>Vitamins and Minerals</th>
<th>Males, 50 - 65 years</th>
<th>Females, 50 - 65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>retinol equivenet µg</td>
<td>Mean 1198 SD 1203</td>
<td>Mean 870 SD 835</td>
</tr>
<tr>
<td>Vitamin B1 mg</td>
<td>1.42 0.73 1.1</td>
<td>1.3 1.79 1.1</td>
</tr>
<tr>
<td>Vitamin B2 mg</td>
<td>1.75 0.59 1.5</td>
<td>1.5 0.6 1.1</td>
</tr>
<tr>
<td>Vitamin B6 mg</td>
<td>1.92 0.63 1.8</td>
<td>1.51 0.55 1.5</td>
</tr>
<tr>
<td>Vitamin C mg</td>
<td>85 52 70 2000</td>
<td>94 56 70 2000</td>
</tr>
<tr>
<td>Vitamin D µg</td>
<td>4.9 3.2 5.10 60</td>
<td>3.3 2 6.10 50</td>
</tr>
<tr>
<td>Vitamin E mg</td>
<td>14.5 7.4 10.7 300</td>
<td>11.2 6.1 8.7 300</td>
</tr>
<tr>
<td>Sodium mg</td>
<td>325 1193 &lt;2400</td>
<td>2561 1253 &lt;2400</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>1112 437 1100 2500</td>
<td>996 416 1100 2500</td>
</tr>
<tr>
<td>Phosphorus mg</td>
<td>1740 463 700-1400 4000</td>
<td>1386 385 700-1400 4000</td>
</tr>
<tr>
<td>Magnesium mg</td>
<td>375 104 300-350 500</td>
<td>300 86 250-300 500</td>
</tr>
<tr>
<td>Iron mg</td>
<td>12.9 3.6 9</td>
<td>10.7 3.3 8</td>
</tr>
<tr>
<td>Copper mg</td>
<td>1.25 0.38 1.5-3.5 5</td>
<td>1.03 0.35 1.5-3.5 5</td>
</tr>
<tr>
<td>Selenium µg</td>
<td>53 24 50-150 300</td>
<td>42 23 50-150 300</td>
</tr>
<tr>
<td>Zinc mg</td>
<td>11.4 3.3 10 25</td>
<td>9.3 2.8 9 25</td>
</tr>
</tbody>
</table>

The red marked cells are showing the intakes which are higher than the UL. The red numbers are showing the intakes which are lower than the RDA.
Appendix III: Ingredients and their health aspects

A. Fibres

Fibres have a prebiotic function: they are good for the health of the intestine and might reduce the risk of heart disease. Especially soluble fibres like psyllium, β-glucan, pectin and guar gum might decrease the LDL-cholesterol level.

A disadvantage of most of the fibres is that they bind with the vitamins and minerals and reduce their uptake. An exception is oligofructose which increases the uptake of minerals.

Inulin

Inulin is a soluble fibre which can increase the dietary fibre content in products. It has a low caloric content, and is therefore suitable for a snack that contributes to weight management. Inulin is an oligofructose and a daily intake of 8g/day has the ability to enhance the uptake of calcium in the body. It strengthens human immune system, is able to lower the cholesterol level and might improve the health of the intestine. Inulin is tasteless, dissolves in water and is therefore suitable for liquids. It is furthermore very suitable for use in other methods like baking, frying and cooking.\(^\text{18}\)

Linseed

Linseed is a rich source of omega-3-fatty acids and contains about 15-21% α-linoleic acid. The fatty acids are very stable and can be stored for a long time because they do not oxidise very quickly. Linseed has a sweet and nutty taste and contains the fibre lignin. Lignin might lower the level of LDL cholesterol, total cholesterol and triglycerides. It might protect against heart disease and some types of cancer. The flour can be used in products that can as well be made from soy flour, like cookies and bars.\(^\text{20}\)

B. Vitamin C

Rich sources of vitamin C are in particular: fruit (berries), vegetables, potatoes. Especially red fruits contain high amounts of vitamin C and other anti-oxidants. Vitamin C is an anti-oxidant and prevents scurvy. It might prevent against some types of cancer and CHD, although more investigation is needed to confirm this.

C. Vitamin D

Rich sources of vitamin D are: fatty fish, meat, milk products (full fat), eggs. The synergy between vitamin D and calcium might prevent osteoporosis. Therefore, vitamin D is desired for the snack for the target group, because they have a higher risk of getting osteoporosis. Unfortunately, there are not many ingredients with a high vitamin D content which are suitable for the snack.

D. Vitamin E

Rich sources of vitamin E are: sunflower oil, wheat germ oil, safflower oil, bread, cereal products, nuts, almonds, seeds, vegetables and fruit, soy.

Vitamin E, also known as alpha-tocopherol, is a fat-soluble vitamin with an anti-oxidant function that might prevent against CHD. Vitamin E is associated with slowing down the signs of Alzheimer’s disease and lowering the risk of prostate cancer. Products rich in vitamin E are described below and might be useful for the snack.

Sunflower oil

Sunflower oil contains 76mg/100g vitamin E. Therefore it is a rich source of vitamin E. Sunflower oil has a good fatty acid composition: it is rich in poly unsaturated fatty acids and does not contain trans fat.\(^\text{11}\)

Safflower oil

Safflower oil is a vegetable oil with a high amount of vitamin E and a rich source of polyunsaturated fatty acids. These fatty acids might improve the cholesterol level.
A disadvantage of a high amount of unsaturated fatty acids is rancidity. Using an antioxidant can solve the rancidity problem.  

**Sunflower seeds**
The sunflower oil described above is made from sunflower seeds. Besides vitamin E, sunflower seeds are also a rich source of thiamine, vitamin B₆, phosphorus and magnesium and add fibres to the product. Sunflower seeds are easily available and might be used for example as a topping or as an ingredient in a dough.

**E. Potassium**
Rich sources of potassium are: fruit and vegetables, potatoes, meat, bread, milk, nuts. Especially dried fruit is a rich source of potassium. Together with sodium, potassium regulates the blood pressure. The target group has an increased risk of high blood pressure. Potassium might contribute to a better immune system as well. Therefore, a higher intake of potassium might be beneficial to health.

**Soy flour**
Soy is often used as a meat replacer because of its high protein quality. Soy is rich in unsaturated fatty acids, contains no cholesterol, and is a good source of potassium and isoflavones. Isoflavones might play an important role in reducing the number of hot flushes during menopause. Soy is an ingredient that is widely available and might be used in a broad spread of products.

**Apricots**
Apricots are a rich source of potassium. 100 grams of dried apricots contain 1500mg potassium, which is almost 1/3 of the RDA (as shown in Appendix I).

**F. Calcium**
Rich sources of calcium are: milk(products), cheese, vegetables, nuts, legumes. Calcium is a mineral that can prevent osteoporosis and might minimise the risk of bone fractures.

**Quinoa**
Quinoa is a rich source of protein and calcium. Quinoa contains 874mg of calcium per 100grams. Quinoa is a gluten-free product that can be ground and used as a flour to make bread or pasta.

**Teff**
Teff is a gluten-free flour with a high content of iron, calcium, zinc and magnesium. It has a good balance of amino-acids, complex carbohydrates and a low Glycemic Index (GI). It is a suitable grain for extrusion, to make a gluten-free product with high fibre content.

**G. Selenium**
Rich sources of Selenium are: vegetable products, bread and cereals. Selenium is a mineral that protects red blood cells and cells against damage. It might protect the body for prostate cancer, although more investigation is needed. Amaranth and wheat flour are good sources of selenium. These two grains can be used as a base for the new product.

**Amaranth**
Amaranth is a gluten-free product. It makes baked goods more moist and airy. The seeds of the amaranth can be popped like popcorn. It is a rich source of selenium (70.7μg/100g).

**Brazil nuts**
Brazil nuts are a good source of selenium. One nut provides 160% of the RDA of selenium. Brazil nuts contain a high amount of vitamin B1 and minerals like calcium, phosphorus and magnesium. Brazil nuts are associated with a health benefit. Brazil nuts are a rich source of tocopherol, phytosterols and squalene which might reduce the risk of atherosclerosis and cancer.
Aloe Vera
Aloe Vera might improve the absorption of vitamin C (ascorbate) and vitamin E. It could therefore be used in vitamin supplements to enhance absorption. Based on these findings it would seem a good ingredient for the new snack.
Aloe Vera might influence the immune system because of the presence of acemannan, a group of polysaccharides. An improvement of the immune system might help in the treatment of AIDS and some types of cancer. Although this might be a good point for using Aloe Vera, it does have some disadvantages. There is not much scientific evidence that Aloe Vera might be good for people’s health. Prolonged intake of Aloe Vera can lead to potassium losses. For people with diabetes or kidney abnormalities this risk is even higher. A low amount of potassium can lead to irregular heart rhythm and muscle weakness. Because the intake of potassium is already low, Aloe Vera will not be suitable for the new product because of the possible health problems it may cause.

Coenzyme Q10
Coenzyme Q10 might have an anti-ageing effect and might protect against suffering a heart attack. Looking at our target group, many people might be confronted with high blood pressure. Therefore, Q10 might be good to put in the product. Unfortunately, medicines for high blood pressure like beta blockers can, in combination with Q10, lower the blood pressure even more. There might also be such an interaction between chemo therapy medicines and Q10. Q10 might protect the cancer cells by its antioxidant action. The product might still contain some Q10 because it is present in rice, nuts, soy and spinach, although only in small quantities. Therefore, no extra Q10 has been added to the new product because of its possible negative reactions.

Coconut oil
Royal Green cooking cream is a 100% organic coconut oil. This coconut oil was added during the first experiment in the pretzels because of its organic aspect and its absence of trans fat, preservatives, chemical solvents and artificial flavours and colours. A disadvantage of this coconut oil is the high amount of saturated fat (92g/100g). Saturated fat is known for its contribution to the risk of getting heart disease. An advantage of the high amount of saturated fatty acids is that the oil is solid at room temperature. Another advantage is the stability of the oil against oxidation and that the oil does not flow out of the product when it is cooled. Despite these advantages, the use of oil containing high amounts of saturated fat is discouraged because of the risk of raising the cholesterol level and the risk of heart disease.
Table G: Vitamins and minerals which may be declared and their Recommended Daily Allowances (RDA)

<table>
<thead>
<tr>
<th>Vitamin/Mineral</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>µg</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>µg</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>mg</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>µg</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>mg</td>
</tr>
<tr>
<td>Thiamin</td>
<td>mg</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>mg</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>mg</td>
</tr>
<tr>
<td>Folic acid</td>
<td>µg</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>µg</td>
</tr>
<tr>
<td>Biotin</td>
<td>µg</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>mg</td>
</tr>
<tr>
<td>Potassium</td>
<td>mg</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>mg</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg</td>
</tr>
<tr>
<td>Iron</td>
<td>mg</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg</td>
</tr>
<tr>
<td>Copper</td>
<td>mg</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg</td>
</tr>
<tr>
<td>Selenium</td>
<td>µg</td>
</tr>
<tr>
<td>Chromium</td>
<td>µg</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>µg</td>
</tr>
<tr>
<td>Iodine</td>
<td>µg</td>
</tr>
</tbody>
</table>

As a rule, 15% of the recommended allowance specified in this Annex supplied by 100g or 100ml or per package if the package contains only a single portion should be taken into consideration in deciding what constitutes a significant amount.
Appendix V: Nutrition claims

Permitted nutrition claims as listed in the Annex of Regulation (EC) No 1924/2006

LOW ENERGY
A claim that a food is low in energy, and any claim likely to have the same meaning for the consumer, may only be made where the product does not contain more than 40 kcal (170 kJ)/100 g for solids or more than 20 kcal (80 kJ)/100 ml for liquids. For table-top sweeteners the limit of 4 kcal (17 kJ)/portion, with equivalent sweetening properties to 6 g of sucrose (approximately 1 teaspoon of sucrose), applies.

ENERGY-REDUCED
A claim that a food is energy-reduced, and any claim likely to have the same meaning for the consumer, may only be made where the energy value is reduced by at least 30 %, with an indication of the characteristic(s) which make(s) the food reduced in its total energy value.

ENERGY-FREE
A claim that a food is energy-free, and any claim likely to have the same meaning for the consumer, may only be made where the product does not contain more than 4 kcal (17 kJ)/100 ml. For table-top sweeteners the limit of 0,4 kcal (1,7 kJ)/portion, with equivalent sweetening properties to 6 g of sucrose (approximately 1 teaspoon of sucrose), applies.

LOW FAT
A claim that a food is low in fat, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 3 g of fat per 100 g for solids or 1,5 g of fat per 100 ml for liquids (1,8 g of fat per 100 ml for semi-skimmed milk).

FAT-FREE
A claim that a food is fat-free, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0,5 g of fat per 100 g or 100 ml. However, claims expressed as ‘X % fat-free’ shall be prohibited.

LOW SATURATED FAT
A claim that a food is low in saturated fat, and any claim likely to have the same meaning for the consumer, may only be made if the sum of saturated fatty acids and trans-fatty acids in the product does not exceed 1,5 g per 100 g for solids or 0,75 g/100 ml for liquids and in either case the sum of saturated fatty acids and trans-fatty acids must not provide more than 10 % of energy.

SATURATED FAT-FREE
A claim that a food does not contain saturated fat, and any claim likely to have the same meaning for the consumer, may only be made where the sum of saturated fat and trans-fatty acids does not exceed 0,1 g of saturated fat per 100 g or 100 ml.

LOW SUGARS
A claim that a food is low in sugars, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 5 g of sugars per 100 g for solids or 2,5 g of sugars per 100 ml for liquids.

SUGARS-FREE
A claim that a food is sugars-free, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0,5 g of sugars per 100 g or 100 ml.

WITH NO ADDED SUGARS
A claim stating that sugars have not been added to a food, and any claim likely to have the same meaning for the consumer, may only be made where the product does not contain any
other food used for its sweetening properties. If sugars are naturally present in the food, the following indication should also appear on the label:

CONTAINS NATURALLY OCCURRING SUGARS

LOW SODIUM/SALT
A claim that a food is low in sodium/salt, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0.12 g of sodium, or the equivalent value for salt, per 100 g or per 100 ml. For waters, other than natural mineral waters falling within the scope of Directive 80/777/EEC, this value should not exceed 2 mg of sodium per 100 ml.

VERY LOW SODIUM/SALT
A claim that a food is very low in sodium/salt, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0.04 g of sodium, or the equivalent value for salt, per 100 g or per 100 ml. This claim shall not be used for natural mineral waters and other waters.

SODIUM-FREE or SALT-FREE
A claim that a food is sodium-free or salt-free, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0.005 g of sodium, or the equivalent value for salt, per 100 g.

SOURCE OF FIBRE
A claim that a food is a source of fibre, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least 3 g of fibre per 100 g or at least 1.5 g of fibre per 100 kcal.

HIGH FIBRE
A claim that a food is high in fibre, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least 6 g of fibre per 100 g or at least 3 g of fibre per 100 kcal.

SOURCE OF PROTEIN
A claim that a food is a source of protein, and any claim likely to have the same meaning for the consumer, may only be made where at least 12 % of the energy value of the food is provided by protein.

HIGH PROTEIN
A claim that a food is high in protein, and any claim likely to have the same meaning for the consumer, may only be made where at least 20 % of the energy value of the food is provided by protein.

SOURCE OF [NAME OF VITAMIN/S] AND/OR [NAME OF MINERAL/S]
A claim that a food is a source of vitamins and/or minerals, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least a significant amount as defined in the Annex to Directive 90/496/EEC or an amount provided for by derogations granted according to Article 6 of Regulation (EC) No 1925/2006 of the European Parliament and of the Council of 20 December 2006 on the addition of vitamins and minerals and of certain other substances to foods[1].

HIGH [NAME OF VITAMIN/S] AND/OR [NAME OF MINERAL/S]
A claim that a food is high in vitamins and/or minerals, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least twice the value of a source of [NAME OF VITAMIN/S] and/or [NAME OF MINERAL/S].

CONTAINS [NAME OF THE NUTRIENT OR OTHER SUBSTANCE]
A claim that a food contains a nutrient or another substance, for which specific conditions are
For vitamins and minerals the conditions of the claim ‘source of’ shall apply.

INCREASED [NAME OF THE NUTRIENT]
A claim stating that the content in one or more nutrients, other than vitamins and minerals, has been increased, and any claim likely to have the same meaning for the consumer, may only be made where the product meets the conditions for the claim ‘source of’ and the increase in content is at least 30% compared to a similar product.

REDUCED [NAME OF THE NUTRIENT]
A claim stating that the content in one or more nutrients has been reduced, and any claim likely to have the same meaning for the consumer, may only be made where the reduction in content is at least 30% compared to a similar product, except for micronutrients, where a 10% difference in the reference values as set in Directive 90/496/EEC shall be acceptable, and for sodium, or the equivalent value for salt, where a 25% difference shall be acceptable.

LIGHT/LITE
A claim stating that a product is ‘light’ or ‘lite’, and any claim likely to have the same meaning for the consumer, shall follow the same conditions as those set for the term ‘reduced’; the claim shall also be accompanied by an indication of the characteristic(s) which make(s) the food ‘light’ or ‘lite’.

NATURALLY/NATURAL
Where a food naturally meets the condition(s) laid down in this Annex for the use of a nutritional claim, the term ‘naturally/natural’ may be used as a prefix to the claim.

SOURCE OF OMEGA-3 FATTY ACIDS
A claim that a food is a source of omega-3 fatty acids, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least 0.3g alpha-linolenic acid per 100g and per 100kcal, or at least 40mg of the sum of eicosapentaenoic acid and docosahexaenoic acid per 100g and per 100kcal.

HIGH OMEGA-3 FATTY ACIDS
A claim that a food is high in omega-3 fatty acids, and any claim likely to have the same meaning for the consumer, may only be made where the product contains at least 0.6g alpha-linolenic acid per 100g and per 100kcal, or at least 80mg of the sum of eicosapentaenoic acid and docosahexaenoic acid per 100g and per 100kcal.

HIGH MONOUNSATURATED FAT
A claim that a food is high in monounsaturated fat, and any claim likely to have the same meaning for the consumer, may only be made where at least 45% of the fatty acids present in the product derive from monounsaturated fat under the condition that monounsaturated fat provides more than 20% of energy of the product.

HIGH POLYUNSATURATED FAT
A claim that a food is high in polyunsaturated fat, and any claim likely to have the same meaning for the consumer, may only be made where at least 45% of the fatty acids present in the product derive from polyunsaturated fat under the condition that polyunsaturated fat provides more than 20% of energy of the product.

HIGH UNSATURATED FAT
A claim that a food is high in unsaturated fat, and any claim likely to have the same meaning for the consumer may only be made where at least 70% of the fatty acids present in the product derive from unsaturated fat under the condition that unsaturated fat provides more than 20% of energy of the product.
Product 1: Amalattea: Latte di Capra (Goat’s Milk) in Italy
This product is enriched with vitamins B9, B12 and vitamin D. It is a product for children and the elderly: it contains short chain fatty acids which are easily digestible. It also contains taurine, carnitine and selenium.

Nutrition Facts

<table>
<thead>
<tr>
<th></th>
<th>Per 100.00ml</th>
<th>%Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kJ)</td>
<td>260.10kJ</td>
<td></td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>62.20kcal</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
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<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>4.70g</td>
<td></td>
</tr>
<tr>
<td>Sugars</td>
<td>4.70g</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>3.40g</td>
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</tr>
<tr>
<td>Saturated Fat</td>
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<td>Polyunsaturated Fat</td>
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<tr>
<td>Monounsaturated Fat</td>
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<tr>
<td>Cholesterol</td>
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<td></td>
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<tr>
<td>Fibres</td>
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<td></td>
</tr>
<tr>
<td>Sodium</td>
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</tr>
<tr>
<td>Vitamin D3</td>
<td>1.00μg</td>
<td>20.00%</td>
</tr>
<tr>
<td>Vitamin B9</td>
<td>40.00μg</td>
<td>20.00%</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>0.50μg</td>
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<tr>
<td>Calcium</td>
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<td>15.00%</td>
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</table>

Positioning Claims
Children (5-12), Functional - Digestive, Gluten-Free, Low/No/Reduced Allergen, Seniors (aged 55+), Vitamin/Mineral Fortified

Product 2: Gayelord Hauser: Vitality Citrus Fruits, Kiwi and Green Tea Drink in France
This drink is naturally rich in vitamin C and contains no added sugar. The Diet Anti-Oxidant Pomegranate drink, a different variety of this drink, is enriched with vitamin C, E and beta-carotene which is targeted for seniors.

Nutrition Facts

<table>
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<th></th>
<th>Per Serving a 200ml</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kJ)</td>
<td>404.00kJ</td>
<td></td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>96.00kcal</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
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<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>22.20g</td>
<td></td>
</tr>
<tr>
<td>Sugars</td>
<td>16.60g</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>0.20g</td>
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</tr>
<tr>
<td>Saturated Fatty Acid</td>
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<tr>
<td>Fibres</td>
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<td></td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Vitamin C</td>
<td>88.00mg</td>
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<tr>
<td>Theine</td>
<td>34.00mg</td>
<td></td>
</tr>
</tbody>
</table>

Positioning Claims
Low/No/Reduced Sugar, Seniors (aged 55+), Vitamin/Mineral Fortified
Product 3: Guilin Weishijia Food: Black Sesame Paste in China

This black sesame paste, which is a breakfast cereal, is made from black sesame seeds, refined flour and calcium lactate. It is specially designed for middle aged and senior people: it has a smooth texture, contains natural ingredients and has a rich taste. It contains no white granulated sugar.

**Nutrition Facts**

<table>
<thead>
<tr>
<th></th>
<th>Per 100.00g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kJ)</td>
<td>≤1000.00kJ</td>
</tr>
<tr>
<td>Protein</td>
<td>≥4.00g</td>
</tr>
<tr>
<td>Fat</td>
<td>≥2.00g</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>≤0.50g</td>
</tr>
<tr>
<td>Vitamin D</td>
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</tr>
<tr>
<td>Vitamin E</td>
<td>≥100.00mg</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td>≥50.00mg</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>≥10.00mg</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>≥10.00mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>≥100.00mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>≥30.00mg</td>
</tr>
<tr>
<td>Zinc</td>
<td>≥1.00mg</td>
</tr>
<tr>
<td>Ferum</td>
<td>≥1.00mg</td>
</tr>
</tbody>
</table>

**Positioning Claims**

Added Calcium, Low/No/Reduced Sugar, Seniors (aged 55+), Vitamin/Mineral Fortified

Product 4: Cion Bakery: Japanese Green Tea Cake

This cake is a traditional Japanese cake which does not contain trans fatty acids. The product is especially beneficial for seniors and children. It is retailed in a 8x 100g family pack and is suitable for a lunch, picnic or a party.

**Nutrition Facts**

<table>
<thead>
<tr>
<th></th>
<th>Per Serving a 50g</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>150.00kcal</td>
<td></td>
</tr>
<tr>
<td>Total fat</td>
<td>5.00g</td>
<td>8.00%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>1.00g</td>
<td>4.00%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0.00g</td>
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<tr>
<td>Cholesterol</td>
<td>90.00mg</td>
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<td>Sodium</td>
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<tr>
<td>Total carbohydrates</td>
<td>24.00g</td>
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</tr>
<tr>
<td>Dietary fibre</td>
<td>0.00g</td>
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<tr>
<td>Sugars</td>
<td>13.00g</td>
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<tr>
<td>Protein</td>
<td>4.00g</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td></td>
<td>2.00%</td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td>2.00%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td>6.00%</td>
</tr>
</tbody>
</table>

**Positioning Claims**

Children (5-12), Ease of Use, Low/No/Reduced Transfat, Seniors (aged 55+)
General information
Male/Female:
Age:

1. At what time of the day do you feel the need for a snack?
2. What kind of snack do you prefer for your snack moment? (Sweet/savoury?)
3. How much of a snack do you consume at your snack moment?
4. What is the reason for choosing a particular snack?
5. With whom do you mostly snack? (Alone, with others?)
6. Where do you normally snack? (at home, work, on-the-go?)
7. Is there a specific snack that you miss and would buy if it were available in the supermarket?
8. Which important characteristics does a snack have to contain? (authentic, portion size, convenience?)
9. Which products do you find nostalgic? (What do you consider nostalgic?)
10. Are you interested in a nutritional, both tasty and healthy snack? (yes/no, why?)
11. How often do you read the packaging of a snack?
12. Are there products that you have put back on the shelf after you have read the packaging?
13. Would you buy a product because it contains a nutrition claim on the packaging?
14. How important is health for you? Do you buy products which contribute to health?
15. Nowadays there are different health logos on the packaging of products, like the ‘Ik Kies Bewust-logo or the ‘Gezonde Keuze Klavertje vier’ from the Albert Heijn. Do you pay attention to these logos when you are doing your grocery shopping?
16. Is your choice influenced by a specific taste variation of a product? (Italian, Asian, Mexican?)
Appendix VI: Product Ideas

**Product idea 1: Pretzels with dip**

Pretzels:
- Extra long and wide pretzels which can be dipped in a dip.
- Basis: spelt, soy oil, barley, malt.
- With sesame, poppy seed and rasped carrot
- Cumin, paprika powder, cinnamon

Dips: compote, chutney, tzatziki (on yoghurt basis: with added inulin/oligofructose for Calcium/Vitamin D uptake) or hummus

Low in fat, high in fibre, B vitamins.

**Product idea 2: Extruded product**

On a basis of:
- Teff, lentils, soy beans (rich of isoflavones)
- Rasped carrot, tomato pulp, vegetable juice, courgette
- Cranberry, plum, apricot, apple fibre (Vitacel)
- Almond, pecan nuts,
- Topping of linseed, bran, sesame, poppy seed, cumin seed.

Rich in fibre, iron, calcium, potassium, anti-oxidants.

**Product idea 3: Hollow, with nuts and dried fruit filled cracker**

Cracker: basis of whole-wheat, rice, oats and rye
Filling of nuts and dried fruit like apricots, plums, dates, almonds, hazelnuts etc. gelatinized with Agar-agar (suitable for vegetarians)

Produced in circles or sticks.

Rich of fibre, prebiotic function?

**Product idea 4: Filled figs**

Figs filled with a paste of peanuts, almonds and other nuts.

Or filled with goat cheese, honey, caraway seeds and elderflower

Or filled with pecan nuts, gruyere and apple(fibre).

**Product idea 5: Breaking bread/ foccacia**

Bread made of spelt, oat, amaranth, rice.
With variations of quinoa, pecan nuts, apricots and figs.
Or a Italian special with olive, onion, thyme, sea salt.

**Product idea 6: Extruder product based on sushi or ‘rijstepap’**

Extrusion product based on sushi: ingredients like rice, avocado, wasabi, nori, sesame seeds/oil, cucumber, tuna, cocos.

Extrusion product based on ‘rijstepap’: rice, milk, vanilla, cinnamon, red berry juice, butter, sugar, apple, anise, apricots, apple syrup etc.
Table H: Screening of product ideas

<table>
<thead>
<tr>
<th>Product Idea 1: Pretzels with dip</th>
<th>New / Me-too product</th>
<th>Distinctive on the market</th>
<th>Technical feasible</th>
<th>Suitable for the snack assortment</th>
<th>Respond to trends</th>
<th>Sufficient market/sales activity</th>
<th>Consumer expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Product Idea 2: Extruded product</td>
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<td>+/-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
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<tr>
<td>Product Idea 3: Cracker with nuts and fruit</td>
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<td>+/-</td>
<td>+/-</td>
<td>+</td>
<td>-</td>
<td>+/-</td>
</tr>
<tr>
<td>Product Idea 4: Filled figs</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+/-</td>
</tr>
<tr>
<td>Product Idea 5: Breaking bread / Foccacia</td>
<td>+/-</td>
<td>-</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Product Idea 5: Extruded sushi</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
<td>+</td>
</tr>
</tbody>
</table>
Flowchart Stick 1: Pretstick

1. Mixing dry ingredients
2. Mixing for 90sec
3. Rolling out the dough
4. Cutting the dough
5. Lye the sticks
6. Baking for 4min on 240°C
7. Baking for 35min on 130°C
8. Preparing Double Coating (DC)
9. Cooling
10. Coating sticks with DC
11. Dipping sticks in amaranth
12. Dry for 15min on 80°C
13. Finished product
14. Popping amaranth
Soaking dried chickpeas for 1 night

Cooking chickpeas

Blanding chickpeas

Mixing of dry ingredients

Mix on low speed for 60 sec

Mix on high speed for 90 sec

Sheeting the dough 5-7 times

Cutting

Baking sticks for 3 min on 225°C

Drying sticks for 30 min on 80°C

Flavouring the sticks

Final product
Mixing ingredients for adhesive

Warming adhesive

Mixing dry ingredients with adhesive

Putting mix into a plate

Press firmly

Drying plate for 30min on 80°C

Flavouring

Final product

Weighing dry ingredients

Mixing dry ingredients
Flowchart stick 4: Spinstick

1. Defrosting spinach
2. Blending spinach
3. Mix spinach with dry ingredients
4. Weighing dry ingredients
5. Set up extruder:
   - Speed: 450rpm
   - Feed rate: 20kg/h
   - Water feed: 14%
   - Pressure: 35bar
   - Temperature: 30°C, 60°C, 90°C, 110°C, 135°C, 160°C
6. Cutting
7. Drying
8. Flavouring
9. Final product
### Product specification

**Target group**: Baby boomers (50-65 years)

**Product name**: Pretstick (Japanese Soya Sauce)

#### Product characteristics

<table>
<thead>
<tr>
<th>Form</th>
<th>Long stick of 16cm x 0.8cm (see picture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Brown with white sparkles</td>
</tr>
<tr>
<td>Weight</td>
<td>4.4g/stick</td>
</tr>
<tr>
<td>Packaging</td>
<td>Umbrella-like box with four spaces for the sticks.</td>
</tr>
<tr>
<td>Size</td>
<td>20cm</td>
</tr>
<tr>
<td>Aim use</td>
<td>Convenience</td>
</tr>
</tbody>
</table>

#### Ingredient declaration:

Rice flour, Oat flour, Soy flour, Linseed, Gluten, Shortening, Ammonium bicarbonate, Corn syrup, Double Coating [Maltodextrin (potato), Sugar, Vegetable oil (coconut/palm kernel), Salt (NaCl), Silicon dioxide (E551)], Soy flavour [(Milk sugar (lactose), Salt (NaCl), Monosodium glutamate (E621), Garlic, Maltodextrin (potato), Silicon dioxide (E551), Spices & herbs, Potassium phosphates (E340), Arabic gum (Acacia gum) (E414), Disodium guanylate (E627)], Amaranth.

#### Allergen information:

Wheat, Milk, Lactose, Celery, Mustard, Soy.

#### Nutritional information:

<table>
<thead>
<tr>
<th>Per 100 gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
</tr>
<tr>
<td>Protein</td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Sugars</td>
</tr>
<tr>
<td>Fat</td>
</tr>
<tr>
<td>Saturated Fat</td>
</tr>
<tr>
<td>Unsaturated Fat</td>
</tr>
<tr>
<td>Trans Fat</td>
</tr>
<tr>
<td>Fibre</td>
</tr>
<tr>
<td>Sodium</td>
</tr>
</tbody>
</table>

**Shelf life**: 6 Months
Target group: Baby boomers (50-65 years)
Product name: Chickstick (African Chakalaka)

### Product characteristics
- **Form:** Long stick of 16cm x 0.8cm (see picture)
- **Colour:** yellow-brown with green herb leaves
- **Weight:** 1g/stick
- **Packaging:** Umbrella-like box with four spaces for the sticks.
- **Size:** 20cm
- **Aim use:** Convenience

### Ingredient declaration:
Tomate juice, Chick peas, Pea isolate, Red beans, Lentils, Modified starch, Salt, Polyglycerol ester of vegetable fatty acids, Lemon juice, Taste & bite [Monosodium glutamate (E621), Potassium phosphates (E340), Citric acid (E330), Maltodextrin (potato), Sodium carbonates (E500), Silicon dioxide (E551)], Fat enhancement [Maltodextrin (potato), Modified Starch (E1450) (tapioca), Sugar], Flavouring [Sugar, Salt, NaCl, Monosodium glutamate (E621), Onion, Garlic, Coriander, Silicon dioxide (E551), Spices & herbs, Aspartame (E951)]

### Allergen information:
Wheat, Milk, Lactose, Celery, Mustard.

### Nutritional information:

<table>
<thead>
<tr>
<th>Per 100 gram</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1281 kJ</td>
</tr>
<tr>
<td>Protein</td>
<td>33.8 g</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>26.5 g</td>
</tr>
<tr>
<td>Sugars</td>
<td>0.7 g</td>
</tr>
<tr>
<td>Fat</td>
<td>6.8 g</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>1 g</td>
</tr>
<tr>
<td>Unsaturated Fat</td>
<td>5.8 g</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0 g</td>
</tr>
<tr>
<td>Fibre</td>
<td>6.4 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>1640 mg</td>
</tr>
</tbody>
</table>

### Shelf life:
6 Months
Target group: Baby boomers (50-65 years)

Product name: Fitstick (Italian Bruschetta)

Product characteristics:
- **Form**: Long stick of 16cm x 0.8cm (see picture)
- **Colour**: Brown and white grains with red fruit
- **Weight**: 8g/stick
- **Packaging**: Umbrella-like box with four spaces for the sticks.
- **Size**: 20cm
- **Aim use**: Convenience

Ingredient declaration:
Goji-berri, Pecan nuts, Spelt, Wheat bran, Barley, Amaranth, Water, Double Coating [Maltodextrin (potato), Sugar, Vegetable oil (coconut/palm kernel), Salt (NaCl), Silicon dioxide (E551)], Inulin, Oligofructose, Sorbitol, Flavour [Salt (NaCl), Paprika, Sugar, Dextrose (glucose), Maltodextrin (wheat), Monosodium glutamate (E621), Garlic, Onion, Tomato, Citric acid (E330), Potassium chloride, Silicon dioxide (E551), Paprika extract, Capsanthin (E160c)].

Allergen information:
Wheat, Nuts.

Nutritional information:

<table>
<thead>
<tr>
<th>Per 100 gram</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>1435 kJ</td>
<td>353 kcal</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>8.1 g</td>
<td></td>
</tr>
<tr>
<td><strong>Carbohydrates</strong></td>
<td>45.9 g</td>
<td></td>
</tr>
<tr>
<td><strong>Sugars</strong></td>
<td>14 g</td>
<td></td>
</tr>
<tr>
<td><strong>Fat</strong></td>
<td>11.5 g</td>
<td></td>
</tr>
<tr>
<td><strong>Saturated Fat</strong></td>
<td>1.8 g</td>
<td></td>
</tr>
<tr>
<td><strong>Unsaturated Fat</strong></td>
<td>8.7 g</td>
<td></td>
</tr>
<tr>
<td><strong>Trans Fat</strong></td>
<td>0 g</td>
<td></td>
</tr>
<tr>
<td><strong>Fibre</strong></td>
<td>18 g</td>
<td></td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>295 mg</td>
<td></td>
</tr>
</tbody>
</table>

Shelf life:
6 Months
Target group: Baby boomers (50-65 years)

Product name: Spinstick (French Boursin)

### Product characteristics

<table>
<thead>
<tr>
<th><strong>Form</strong></th>
<th>: Long stick of 16cm x 0.8cm (see picture)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Colour</strong></td>
<td>: light yellow stick with green particles</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>: 1g/stick</td>
</tr>
<tr>
<td><strong>Packaging</strong></td>
<td>: Umbrella-like box with four spaces for the sticks.</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>: 20cm</td>
</tr>
<tr>
<td><strong>Aim use</strong></td>
<td>: Convenience</td>
</tr>
</tbody>
</table>

### Ingredient declaration:
Rice Bran and Germ, Tapioca grits, Corn grits, Red Vegetable Blend [tomato paste, crushed tomato paste, dehydrated onion and carrot, ascorbic acid (E300) and Tocopherols (E306) (added as antioxidants)], Corn Fibre, Rye flour, Spinach, Water, Salt, Garlic, Flavour [Cheese, whey powder, Salt (NaCl), Garlic, Cream powder, Maltodextrin (potato), Parsley, Citric acid (E330), Spices & herbs, Sodium phosphates (E339), Silicon dioxide (E551), Arabic gum (Acacia gum) (E414)].

### Allergen information:
Wheat, Milk, Lactose, Celery, Mustard.

### Nutritional information:

<table>
<thead>
<tr>
<th>Per 100 gram</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1842 kJ</td>
</tr>
<tr>
<td></td>
<td>391 kcal</td>
</tr>
<tr>
<td>Protein</td>
<td>6.3 g</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>52.4 g</td>
</tr>
<tr>
<td>Sugars</td>
<td>1.6 g</td>
</tr>
<tr>
<td>Fat</td>
<td>14.3 g</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>4.2 g</td>
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<tr>
<td>Unsaturated Fat</td>
<td>10.1 g</td>
</tr>
<tr>
<td>Trans Fat</td>
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<tr>
<td>Fibre</td>
<td>14 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>540 mg</td>
</tr>
</tbody>
</table>

### Shelf life:
6 Months


15 Food Safety Authority of Ireland. A Research Study into Consumers’ Attitudes to Food Labelling. December 2009


25 Internal presentation: Snack Explore! Marketing Snacks EAME. Loretta Hazleton, Danielle van Hees


32 Soja http://www.food-info.net/nl/national/ww-soja.htm (13-04-2010)
30 Eragrain het glutenvrije graanproduct voor iedereen.


35 Voedingsstoffen. Voedingscentrum, eerlijk over eten.
http://www.voedingscentrum.nl/nl/eten-gezondheid/voedingstoffen.aspx (08-03-2010)


37 Wetenswaar > Aloe vera
http://www.food-info.net/nl/national/ww-aloe.htm (13-04-2010)

38 Wetenswaar (Coenzym) Q10
http://www.food-info.net/nl/national/ww-q10.htm#3 (13-04-2010)

39 Wetenswaar > Kokos
http://www.food-info.net/nl/national/ww-kokos.htm (17-05-2010)

40 Commission Directive 2008/100/EC