Increasing Pulse Consumption

Influences on dried and canned pulse consumption in the Netherlands

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Preface

The subject of this thesis are the factors that influence pulse consumption amongst the general population in the Netherlands. It provides the foundational research and the methodology and results of a survey study performed in the Netherlands. It was prepared to fulfil the graduation requirements of the International Food Business Program at the Aeres University of Applied Sciences in the Netherlands and Dalhousie University in Canada.

Based on the received feedback on the first version of my thesis, the chapters Materials and Methods, Discussion of Results, Conclusion, and Recommendations have been adjusted.

First of all, I would like to thank my thesis coach, Sintija Kuipers, for keeping me motivated, her hard work, and her guidance during the process of writing this thesis. I would also like to thank my fellow students, who supported me and were always available for a debate about my research. Special thanks go out to dr. Kathleen Kevany of the Dalhousie University, who initially inspired me to look into this particular topic. I would also like to thank my parents for supporting me throughout the process and providing me with the upbringing which brought me to where I am today. Lastly, I would like to thank both Professor Medema and Professor Hartt for assessing my work and providing me with feedback.

I hope you will enjoy reading it!

Peter Dekker

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List of Abbreviations

Abbreviation	Explanation
CBS	Dutch Central Bureau of Statistics
CHD	Coronary Heart Disease
FAO	Food and Agriculture Organization of the United Nations
GHGE	Greenhouse gas emissions
GI	Glycemic Index
IYP	The International Year of the Pulse
NRFI	Nutrient Rich Food Index
NWO	Dutch National Science Council
RIVM	National Institute for Public Health and the Environment of the Netherlands
SDGs	Sustainable Development Goals
SES	Socio-economic status
UN	United Nations
UNEP	United Nations Environment Programme
US	United States
USDA	United States Department of Agriculture
WDP	World Pulses Day
WHO	World Health Organization

Summary

If the world wants to reverse climate change, a dietary change is inevitable (Ranganathan et al., 2016; Willett et al., 2019). The UN puts a lot of trust in the role of pulses in addressing the environmental and social issues of these times. Currently, consumption patterns around the world include too much animal protein. Animal-based protein generally has a higher environmental impact than protein derived from grain and vegetables, including pulses (Ranganathan et al., 2016; Willett et al., 2019). Next to that, a growing body of evidence is supporting the healthiness of eating pulses. Consuming pulses has already been linked to reducing the risk of heart disease, diabetes, and cancer (Hall et al., 2016; Havemeier et al., 2017). Furthermore, they offer great nutritional value for money (Drewnowski, 2010b, 2010a; Zanovec et al., 2011). Potentially, increasing pulse consumption could lower the environmental impact of diets and solve health inequity. Within the Netherlands, pulse consumption frequency is three times below and a 100 grams short on a weekly basis compared to the standard recommended by the Dutch Nutrition Centre (Voedingscentrum, 2020a).

In order to allow public institutions, non-governmental organizations, and the pulse industry to increase pulse consumption in the Netherlands, this study aimed to identify factors influencing pulse consumption in the Netherlands. A web-based questionnaire was set-up in Google Forms and the following factors were tested: consumption frequency, meat-reducing diets, competence, belief in health benefits, different attitudes, preferred pulse characteristics, and demographic factors. Data collection took place between June 29th and July 26th, 2020. The questionnaire was published using Facebook and LinkedIn. The data were analysed through cross-tabulations and tested with Pearson's chi-square. The belief in health benefits, existing out of seven statements, had a Cronbach's alpha of 0,777 and thus was additionally analysed as a scale measure. The analysis was performed using SPSS 26.

In total 321 responses were obtained. The sample had an overrepresentation of people between 15 and 34, women, bachelor degrees, and low and medium-income groups. With regards to income, a large number of missing values was noted. Significant correlations were found between pulse consumption frequency and the following factors: following a meat reducing diet, competence, belief in health benefits, and 3 of the 4 tested attitudes. Following a meat reducing diet and an increased feeling of competence was linked to an increased pulse consumption frequency. Although most respondents reacted neutrally to the statements of health benefits, which implies unawareness of the health benefits, an increased belief in the health benefits was correlated with an increased pulse consumption frequency. Agreeing with the environmental friendliness and tastiness of pulses was linked to an increased pulse consumption, whereas agreeing with pulses being the poor man's meat was linked to a decreased pulse consumption.

It can be concluded that following a diet focused on meat reduction, competence, knowledge about the healthiness, environmental friendliness, and finding pulses tasty are all positively correlated with an increased pulse consumption frequency. The low sensory appeal, price, and finding pulses the 'poor man's meat' are barriers to increasing pulse consumption. No demographic influences on pulse consumption were found. However, because of the limitations of this research influence of demographic factors on pulse consumption can not be ruled out. Based on these findings, non-governmental organizations, public institutions, and the pulse industry could adjust their messaging to try to increase pulse consumption.

1. Introduction

If the world wants to reverse climate change, a dietary change is inevitable (Ranganathan et al., 2016; Willett et al., 2019). Already in 1992, the Union of Concerned Scientists sent out an appeal to government leaders around the world. It was an immediate call to action to change the stewardship of natural resources to avoid human misery and irreversible environmental impacts. It was signed by 1,575 renowned scientists, including 99 of the 166 living Nobel laureates (Kendall, 1992). 25 years later, in 2017, a second notice was released, signed by over 15,000 scientists from 184 different countries. The authors recognize humanity's failure to make sufficient progress. They ask scientists, media influencers, and citizens to insist that their governments take immediate action (Ripple et al., 2017).

The problem has already been recognized globally. In 2015 during the 21st Conference of Parties in Paris, almost 200 countries agreed upon a new Climate Agreement. The main objective of the Climate Accord is to keep the global temperature rise 'well below' 2°C (Nederlandse Emissieautoriteit, 2016). Next to that, in 2016 the United Nations' (UN) Sustainable Development Goals (SDGs) came into effect. The 17 goals are focused on protecting the planet, reducing climate change, and to improve the health and well-being of all people(United Nations, 2019).

But, more action to reduce climate change is required. In the Emission Gap Report of 2019, the UN Environment Programme (UNEP), concluded that the past decade the emissions increased on average 1,5% on a yearly bases (UNEP, 2019). The report concluded that even with the current actions taken by national governments, the global temperature rise will be around 3°C (UNEP 2019). At the Climate Summit of Madrid, Member of the European Parliament, Bas Eickhout, was cited in a news article telling that he understood why people worldwide are protesting against their national governments. He stated: *"National governments are doing too little to reduce their carbon emissions"* (Ekker, 2019). This is statement is supported by citizens suing their government across the globe. In the Netherlands in 2013, the Urgenda Foundation, together with 900 co-plaintiffs, sued the Government of the Netherlands for taking too little action to reduce the carbon emissions (Stichting Urgenda, 2020). In 2015 the court ordered the Dutch Government to reduce the carbon emissions with 25% in 2020 relative to 1990. In 2019, in a higher appeal, the High Council ruled that the verdict stands (Stichting Urgenda, 2020).

2016, the year after the Paris Agreement, became the year of a potential part of the solution to climate change. During the 38th FAO (Food and Agriculture Organization of the United Nations) Conference in 2013, the UN General Assembly declared the year 2016 as "the International Year of the Pulse" (IYP). The proposal for the IYP was submitted by Turkey and Pakistan, supported by other countries. They believe that pulses can play a major role in addressing the environmental issues of these times and increase global health and food security (FAO, 2016). Pulses are part of traditional cuisines all around the world. The Minister for Food, Agriculture and livestock of Turkey, His Excellency Mr. Mehmet Mehdi EKER, described the role of pulses in these cuisines as follows:

"We should not undermine how tasty they are. Pulses are a major part of various traditional cuisines. Dry beans served on rice is one of the famous traditional Turkish dishes that are falafels and hummus in the Middle East, dall in India, Pakistan, and Bangladesh, and bean paste burritos, soups, and stews in Latin American countries. There is also chick pea flour bread, known as socca in France, farinata in Italy, and fainá in Argentina. We should not forget the famous Mexican chilli (FAO, 2016).*"*

The purpose of the IYP was twofold. Firstly, to raise awareness regarding the benefits of pulses. Secondly, to encourage stakeholders to work towards improving productivity and increasing the production of pulses (FAO, 2016). The IYP will also link back to the second SDG, Zero Hunger (FAO, 2016; United Nations, 2019).

In order to increase awareness about pulses and the IYP the following was achieved: over 700 events were organized worldwide, 1 billion social media impressions were earned, over 5 million people actively engaged on social media, 2.500 IYP related media articles were published, hundreds of recipes were exchanged, IYP's videos got more than 4 million views and the website http://www.pulses.org got almost 4 million visits in 2016, during the IYP (Calles, Xipsiti & Castello, 2019). During and after IYP, the number of publications about pulses also increased from 10 in 2014 to 31 in 2017 globally (Calles et al., 2019). In order to build on the momentum created by IYP, the UN decided to make 10 February "World Pulse Day" (WPD) (UN General Assembly, 2019). However, in order to create an enabling environment, researchers of the FAO recognized that an array of different stakeholders should participate in the organization of WPD (Calles et al., 2019).

1.1 Pulses Defined

All this talk about pulses, but still one might not know what they are. Even an FAO Agricultural Officer admits that he receives the question "But what are pulses?" on a regular basis (Calles, 2016). Pulses are members of the legume family with one to twelve grains. Size, shape, and colour vary within a pod. They are used in both animal feed and for human consumption. The term "pulses" is reserved for crops harvested for dry grains, therefore, fresh green peas and green beans are classified as vegetable crops. Soybeans and groundnuts, which are grown primarily for oil-extraction, cannot be classified as pulses either. The last exception in the legume family which cannot be identified as a pulse are legumes used solely for sowing uses like alfalfa (Calles, 2016; FAO, 2014). In figure 1, below, the different types of legumes and pulses are depicted.
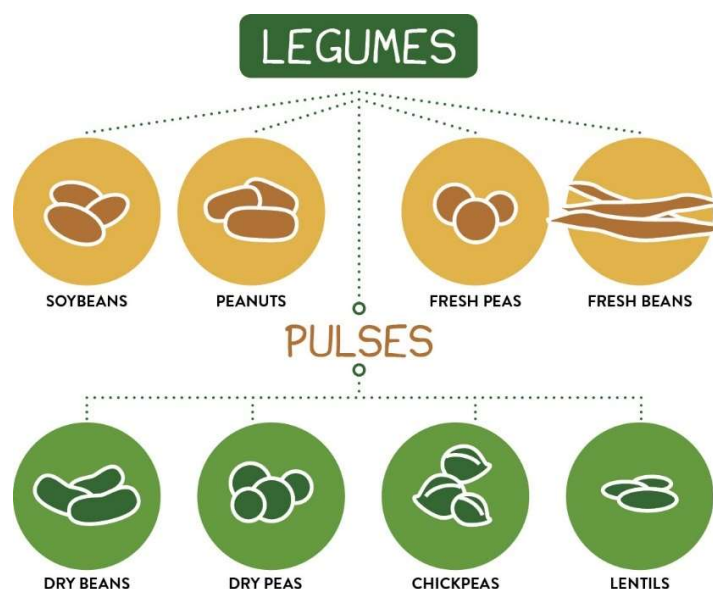
Figure 1 Legumes and Pulses, the difference depicted (Pulse Canada, 2020)

In figure 1, it is shown how pulses fit in the legume family. As earlier described soybeans, peanuts, fresh peas, and fresh beans are not considered pulses. The four main types of pulses according Pulse Canada (2020) are dry beans, dry peas, chickpeas, and lentils. Pulses are available in most grocery stores either dried or canned form (Brocken, 2020). Lastly, Pulse Canada (2020) defines pulses as: *"Pulses are the dried edible seeds of certain plants in the legume family."*

1.2 Shifting Diets for the Environment's Sake

The UN's trust in the role of pulses in addressing the environmental and social issues of these times is backed by two comprehensive reports: "Shifting Diets for a Sustainable Food Future" and "Food in the Anthropocene: the EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems". Overconsumption is becoming a major problem in the developed world. Currently, there are two and a half times more people overweight than undernourished (Ranganathan, Vennard, Waite, Lipinski & Searchinger, 2016). Overconsumption of both calories and protein results in unnecessary use of agricultural resources, unnecessary environmental impacts, decreasing public health, increasing healthcare costs and lost productivity (Ranganathan et al., 2016; Willett et al., 2019).

Another major problem is the increasing consumption of animal-based protein. Animal-based protein generally has a higher environmental impact than protein derived from grain and vegetables (Ranganathan et al., 2016; Willett et al., 2019) Over a period of 50 years (1961-2009), animal-based protein availability grew by 59%, whereas plant-based protein availability only grew by 14% (Ranganathan et al., 2016). In figure 2, below, it can be seen how the environmental impact of plant-based protein compares to animal-based protein.
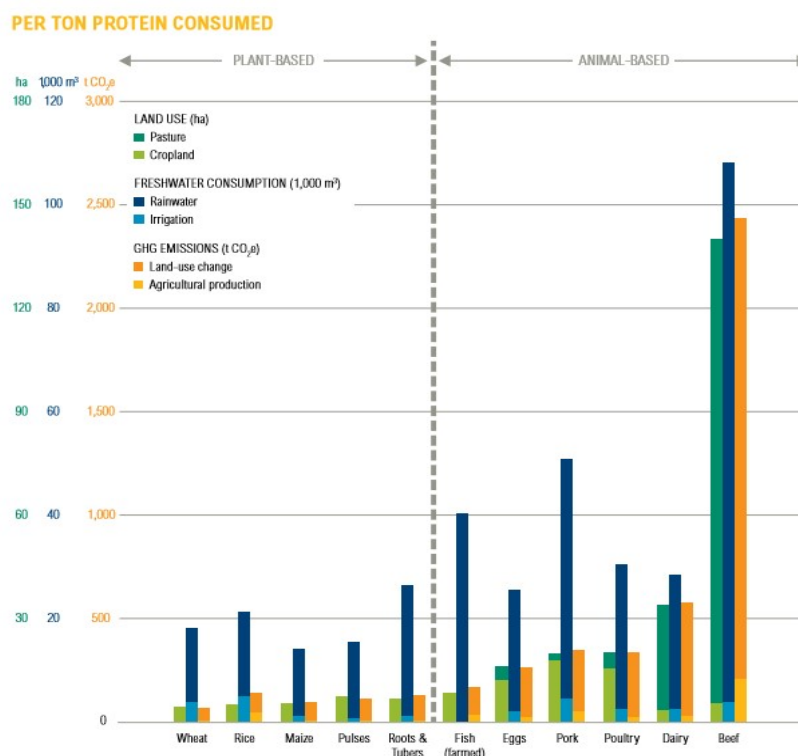
Figure 2 Environmental Impact of Different Protein Sources (Ranganathan et al., 2016)

In figure 2, the use of land, the use of water, and the greenhouse gas emissions (GHGE) per ton protein consumed for different protein sources are depicted. As shown, plant-based protein sources use less land, less water, and produce less greenhouse gas emissions compared to animal-based protein sources. As can be seen in figure 2, beef has the biggest environmental impact in the animal-based protein group, whereas farmed fish has the least environmental impact. One of the reasons for the higher environmental impact of beef is the low "feed to food" conversion of ruminants. It is estimated that only 1% of calories and 4% of protein are converted by cattle to beef for human consumption. In comparison, poultry converts 11% of calories and 20% of protein

Ranganathan et al. (2016) calculated the effect of three different strategies on land-use and GHGE. The three strategies were: reducing overconsumption of calories, reducing the overconsumption of protein by reducing consumption of animal-based protein and reducing consumption of beef specifically. For each strategy, they calculated three scenarios ranging from realistic to ambitious. They applied their scenarios to the average American diet of 2009. They found out that, by reducing the amount of beef consumed the land use and GHGE per person could be reduced by 15% to 35% A reduction of beef consumption by a third, and replacing those with pulses would result in a reduction of land use and GHGE of 15%

Willet et al. (2019) take it a step further. They calculated a healthy reference diet for both human and planetary health. The transformation to the healthy reference diet would result in a more than 200% increase in consumption of fruits, vegetables, pulses, and nuts and a more than 50% reduction in consumption of red meat and added sugars (Willett et al., 2019).

A study performed in the Netherlands by Van de Kamp, Seves & Temme (2018), assessed how reduced consumption of meat, cheese, alcoholic, and soft-drink could lower diet associated GHGE, whilst improving diet quality. They found that reducing meat intake (by 50% or 75%) could reduce the daily amount of CO2 emissions for men from 6,7 kg to 5,6 or 5,1 kg respectively. For women daily CO2 emissions could be reduced from 5,1 kg to 4,4 or 4 kg These adjustments also lead to a reduced energy intake which is beneficial for most of the study's participants since 54% of men and women in the highest tertile of consumption were overweight. However, for some people, the reduction could lead to insufficient energy and iron consumption. Nutritious alternatives were mentioned as a solution but not defined.

Next to the lower amount of land used, water used, and GHGE, pulses also have the potential to lower the amount of synthetic nitrogen used in crop rotations (Hossain et al., 2016; MacWilliam, Parker, Marinangeli & Trémorin, 2018). Plants require nitrogen as a nutrient and the processing of nitrogen by the plant is an important part of photosynthesis (Sulieman, 2011). Currently, cropping systems rely mostly on the use of inorganic nitrogen, which also requires a large amount of non-renewable resources to be used (Wile et al. 2014). Next to that, nitrate could leach into ground and surface water (Wile et al., 2014). Pulses can fix atmospheric nitrogen through symbiosis in the soil (Hossain et al., 2016). MacWilliam et al. (2018) compared the GHGE intensity of pulse-containing and pulse-free rotations in western Canada. Inclusion of pulse crops in pulse-free rotations was found to be beneficial for reducing the GHGE of a rotation. Mostly, because the synthetic nitrogen requirement was reduced whilst yields were maintained or even improved.

1.3 Health Benefits of Pulses

As Willett et al. (2019) already concluded, a diet containing pulses is both good for the planet as well as personal health. There is a growing body of evidence describing the health benefits of pulses. Consuming pulses can reduce the risk of heart disease, diabetes, and cancer (Curran, 2012; Hall, Hillen, & Garden Robinson, 2016; Havemeier, Erickson & Slavin, 2017; Singhal, Kaushik & Mathur, 2014; Viguiliouk, Mejia, Kendall & Sievenpiper, 2017). Furthermore, it can help control body weight (Curran, 2012; Hall et al., 2016; Havemeier et al., 2017; Li et al., 2014), increase longevity (Blackberry et al., 2004; Hall et al., 2016) and play a positive role in digestion (Hall et al., 2016).

Pulses are known as a nutrient-dense food product. On average, pulses contain between 15% and 30% protein, are high in dietary fiber and starch, and also contain a lot of minerals, vitamins, and anti-oxidants (Hall et al., 2016; Havemeier et al., 2017). Pulses are rich in the following micronutrients: selenium, thiamin, niacin, folate, riboflavin, pyridoxine, potassium, zinc, vitamin E, vitamin B, vitamin C and vitamin A (Hall et al., 2016; Havemeier et al., 2017; Singhal et al., 2014). Pulses are lacking in some important amino-acids. Therefore, it is important to combine pulses with other protein sources (grains and/or meats) in order to consume all essential amino-acids (Havemeier et al., 2017). Because pulses contain a large number of essential nutrients and micro-nutrients, the consumption of pulses can have many positive health implications.

The consumption of pulses has been linked to a reduction in risk of coronary heart disease (CHD) (Hall et al., 2016; Viguiliouk et al., 2017) and a possible reduction of stroke risk (Viguiliouk et al., 2017). This reduction can be contributed to different nutritional properties of pulses. High levels of cholesterol in the blood are associated with an increased risk of CHD. Several studies, with consumption ranging from half a cup a day to 4 servings of 100 grams of pulses a week, have found that pulse consumption lowers cholesterol levels (Hall et al., 2016; Viguiliouk et al., 2017). Substituting other product groups for pulses, for example, rice or red meat was also found to contribute to a reduced risk of CHD (Viguiliouk et al., 2017). A meta-analysis of the effect of pulses on stroke risk found that pulse consumption might reduce stroke risk (Viguiliouk et al., 2017). However, the consumption of canned pulses is associated with a higher sodium intake which might increase the risk of cardiovascular diseases (Hall et al., 2016; Mudryj et al., 2012). The rinsing and draining of canned beans for ten seconds can reduce the sodium content by 41% (Duyff, Mount & Jones, 2011).

Pulses can help prevent and/or manage diabetes because of their high fiber content and low glycaemic index (GI) (Hall et al., 2016; Havemeier et al., 2017). The glycaemic index is a measure of the effect of food on the blood sugar level after the meal (Jenkins et al., 1981). Because of the high protein and fiber content of pulses, they score low on the GI (Havemeier et al., 2017). Because pulses have a lower effect on blood sugar levels, pulses can help control blood sugar levels which is important in managing diabetes type 2 (Singhal et al., 2014).

Consuming pulses is associated with reduced risk on certain types of cancer, because of their anti-oxidant, fiber, and micronutrient contents (Hall et al., 2016). If consumed in combination with ample fruits and vegetables, pulses can reduce the risk of prostate cancer (Hall et al., 2016). Next to that, pulses have been associated with a decrease in the risk factors for colon cancer (Hall et al., 2016; Singhal et al., 2014).

As mentioned earlier, overweight is becoming a bigger problem than undernourishment. Nowadays, there are 2,5 times more people overweight than undernourished. Also, healthcare costs worldwide associated with obesity are immense. In 2012 they were estimated to be $2 trillion (Ranganathan et al., 2016). Pulses can play an important role in weight management. Pulses increase satiety due to their high dietary fiber and protein content and their slowly digestible carbohydrates (Hall et al., 2016; Li et al., 2014). Also, associations were found between increased pulse intake and decreased weight (Hall et al., 2016; Li et al., 2014). Next to helping in weight management, the high fiber content also helps healthy digestion (Hall et al., 2016). Although a lot of people associate the consumption of pulses with an increase in flatulence, this perception might be exaggerated. In a journal article looking at 3 different feeding studies, in which participants consumed half a cup of beans a day, only 11% reported an increase in perceived flatulence (Winham & Hutchins, 2011). Lastly, pulse consumption can be linked to increased life-expectancy (Blackberry et al., 2004; Hall et al., 2016). A study called the "Food Habits in Later Life" was undertaken under five groups of elderly people, aged 70 or above, in Japan, Sweden, Greece, and Australia. The only food group that showed a reduction in mortality ratio was the legume food group (including pulses). Mortality risk was reduced by 7 to 8% with each 20 gram increase in daily intake (Blackberry et al., 2004).

1.4 Solving Health Inequity – Not (P)easy

As mentioned earlier, reducing the consumption of meat and other animal based proteins benefits both the environment and diet quality (Ranganathan et al., 2016; Van de Kamp et al., 2018; Willett et al., 2019). A study performed by the World Health Organization (WHO) estimated that in 2017 in the European Union over 950.000 deaths and over 16 million years of healthy life lost were caused by unhealthy diets (James et al., 2018). People with lower socio-economic status (SES) often have a lower diet quality (Konttinen, Sarlio-Lähteenkorva, Silventoinen, Männistö & Haukkala, 2013; Olstad, Campbell & Raine, 2019; Winham, Florian & Thompson, 2016). In a report prepared by Marmot et al. in 2014, the relation between SES and the prevalence of obesity in the European Region was researched. They found that people with a low SES and a lower level of education, have a higher prevalence of obesity (Marmot et al., 2014). Approximately 25% of the risk of obesity among men and 50% of the risk of obesity among women can be linked to SES (Marmot et al., 2014). It was also concluded that inequality is widening (Marmot et al., 2014). Furthermore, people with a lower SES put more focus on price and familiarity when purchasing food rather than health benefits (Konttinen et al., 2013). In Canada, with every step down the social ladder, both overall diet quality and fruit and vegetable intake decline (Olstad et al., 2019).

A study looking into the cost of US foods related to their nutritive value found that fruits and vegetables were more expensive per calorie compared to products in the category grains and sugars. This supports the association between low-cost, energy-dense foods that are nutrient poor and people with a low SES (Drewnowski, 2010a). Another study in the US used the Nutrient Rich Food Index (NRFI), a formal scoring system that ranks foods based on their nutritional value, and compared that to food prices datasets (Drewnowski, 2010b). Fruits, vegetables, dry beans, legumes, and eggs scored the highest on the NRFI, whereas sweets, sugars, and beverages scored lowest (Drewnowski, 2010b). However, fruits and vegetables were also associated with a higher energy cost (dollars per 100 kcal), dry beans and eggs were not (Drewnowski, 2010b). Next to that, the study found that dry beans are amongst the lowest cost sources of protein, fiber, iron, potassium, and zinc (Drewnowski, 2010b). The study concluded that dry beans, legumes, eggs, nuts, and seeds provided the best nutritional value for money (Drewnowski, 2010b).

Another research, looking specifically at the difference between canned and dried beans, concluded that dried beans contain more energy, protein, fiber, iron, potassium, and magnesium and also contain less sodium than canned beans (Zanovec, O'Neill & Nicklas, 2011). However, Zanovec et al. emphasized that both dried and canned beans are a nutrient rich food, and that consumption should be encouraged in a healthy diet (2011).

Per 100.000 inhabitants in the European Union, approximately 240 years of healthy life are lost due to a diet low in legumes (daily consumption of fewer than 60 grams) (James et al., 2018; Maragkoudakis, 2020). Winham, Tisue, Palmer, Cichy & Shelley(2019) state that below optimal pulse consumption is of concern for all people, not only those with a low SES. Health inequality is not compatible with the European Union's commitment to solidarity, cohesion, equal opportunities, and human rights (European Commission, 2010). According to the European Commission, policies targeting diets, nutrients, or specific foods or drinks have the potential to improve diet quality amongst populations (Maragkoudakis, 2020). Next to that, promoting pulse consumption through education and government programs may help reduce the risk of diseases that disproportionately affect low SES people (Winham et al., 2016).

In the Netherlands health inequality is also a problem. According to numbers collected by the Dutch Central Bureau of Statistics (CBS) between 2011 and 2014, the difference in life expectancy between people with a primary school degree and people with a university degree is 6 years for men and 6,7 years for women (CBS, 2016). The difference in healthy life expectancy is even larger, 18,7 years for men and 19 years for women (CBS, 2016). Based on numbers from the same period, the difference in life expectancy between the lowest income group and the highest income group is 8,2 years for men and 6,7 years for women (CBS, 2019b). The difference in healthy life expectancy between these income groups is 17,5 years for men and 18,8 years for women (CBS, 2019b). Furthermore, 43,2% of the 20% of the population with the lowest income was overweight and, whereas 20% with the highest income 39,5% is overweight (CBS, 2018). With regards to severe overweight 14,7% of the lowest income group suffer from severe overweight compared to 8,8% of the high income group (CBS, 2018). Dutch citizens with a lower level of education have a lower life expectancy and healthy life expectancy. Dutch citizens with a low income have a lower life expectancy and healthy life expectancy as well as being overweight and severe overweight more often.

1.5 Discourse on a Healthy Pulse Consumption

Scientists still have not found common ground on defining a recommended serving size of pulses in a balanced diet (Marinangeli et al., 2017). According to the healthy reference diet of Willet et al. (2019), a healthy reference intake would be 75 grams a day. Marinangeli et al. (2017) recommend a serving size of 100 grams of cooked pulses for aligning promotion strategies. However, they leave the frequency of consumption adjustable based on culture and cuisine (Marinangeli et al., 2017). Pulse Canada and the United States Department of Agriculture (USDA) recommend 1,5 cup (300 grams) of cooked pulses a week (Pulse Canada, 2016; USDA, 2015). The WHO regards a diet with less than 60 grams of pulses a day as a diet low in pulses (James et al., 2018).

The European Union encourages its member states to have food-based dietary guidelines. They chose not to have a European dietary guideline, because of country specific food availability, eating habits, and cultural characteristics. These are too diverse for a European food-based dietary guideline to be feasible (European Commission, 2020). Thus, food-based dietary guidelines are regulated on a national level within the European Union.

On the website of the EU Science Hub, a table containing a summary of recommendations for legume consumption of all the countries in the European Region is published. The table contains quantitative and qualitative recommendations as well as the portion size used by the country. Legumes or pulses are either grouped under the fruit and vegetable category, cereal category, or protein category. Most countries identify pulses as part of the protein category. For example, the qualitative recommendation of Bulgaria is to replace meat with fish, poultry, or pulses. Switzerland recommends three portions of cereal foods, potatoes, or pulses a day (a portion being 60-100 gram of uncooked product). Austria and Sweden on the other hand include legumes as part of the vegetable groups (European Commission, 2020).

The advised consumption frequency and portion size vary greatly on a national basis. Greece advises 3 servings of 150-200 grams of cooked beans a week. Spain and France advise the consumption of two to three times a week without providing a portion size. Estonia advises three to four portions of 30 grams of dried legumes a week. Other countries just suffice to eat more pulses or increase legume consumption. Some of the countries include legumes in the rotation of different proteins. For example, Wallonia, the French-speaking half of Belgium, advises eating proteins two times a day switching between meat, poultry, fish, eggs, pulses, and plant-based alternatives (European Commission, 2020).

The Dutch Nutrition Center (Voedingscentrum) developed the Wheel of Five as a dietary guideline. It was last updated in 2016 (Voedingscentrum, 2016). The five categories are fruits and vegetables, fats, protein products, cereal and potato products, and lastly drinks. Pulses are grouped under protein products (Voedingscentrum, 2020a). The guideline with regards to pulses states that pulses should be consumed once a week. On the day of pulse consumption, consuming meat is not necessary (Voedingscentrum, 2020b). The advised serving size of pulses is 135 grams for an adult male or female (Voedingscentrum, 2020a).

1.6 Current Dutch Pulse Consumption

The National Institute for Public Health and the Environment of the Netherlands (RIVM), conducts a food consumption survey on a periodic basis since 1987. The data give insights into what the Dutch population eats in terms of foods, nutrients, and harmful chemical substances. It is also used to identify the development of food trends in the Netherlands. This helps to formulate and evaluate the food-based policies and guidelines (RIVM, 2011). The last published food consumption survey took place between 2012 and 2016 (RIVM, 2017). Dutch adults eat five grams of pulses a day on average (RIVM, 2017). On average a Dutch adult consumes pulses once per three weeks (RIVM, 2017). Comparing the consumption of the period from 2012 to 2016 to the in 2016 published Wheel of Five, the population of the Netherlands should eat pulses 3 times as often and average portion size should increase by a 100 grams a week (current consumption of 35 grams a week, advised consumption of 135 grams).

1.7 Importance of Consumer Behaviour

In order to find out why current Dutch consumption is low, it is important to understand consumer behaviour around pulses and what inhibits pulse consumption. Consumer behaviour is about all of the steps a consumers takes whilst buying, using, and even disposing a product or service (Verhage, 2013). Within consumer behaviour, attitudes towards a service or product have a pivotal role. A purchase decision depends on a large part of a consumer's attitude towards the product or service (Blythe, 2013). Attitudes can be defined as: *"a learned tendency to respond to an object in a consistently favourable or unfavourable way"* (Onkvisit & Shaw, 1994). Attitudes are either formed before using a product, through advertising, opinions of peers, and media views or after using by evaluating the product (Blythe, 2013). Negative attitudes can act as barriers to consumption (Blythe, 2013).

1.8 Research in the Netherlands

In the Netherlands, as of yet, not a lot of research has been done focused on pulses specifically. Most of the research has been focused on meat substitutes and reducing meat consumption. One study looking at the influence of meal context on the acceptance of meat substitutes found out that meal context had a positive effect on the acceptance of a meat substitute (Elzerman, Hoek, Van Boekel & Luning, 2011). However, this study used only plant-based meat substitutes that mimicked the properties of meat (Elzerman et al., 2011). Another study conducted in the Netherlands and UK focused on the consumer acceptance of meat substitutes found that barriers for non-users were mostly the relative unfamiliarity and low sensory appeal of meat substitutes (Hoek et al., 2011). A study looking into the pro-environmental protein consumption in Europe found that the Netherlands is the European country least willing to replace meat with vegetables (only 29% of respondents) (De Boer & Aiking, 2018). In contradiction, another study by De Bakker & Dagevos (2010) funded by the Dutch Ministry of Agriculture, Nature and Food Quality which looked into how to make protein consumption more sustainable, found that a large part of the Dutch population belongs to a group called the meat reducers (69,5%), the rest of the population is either a meat-avoider (4%) or meat-lover (26,5%). However, this group is very heterogenous in their motivations and their degree of meat reduction (De Bakker & Dagevos, 2010). This study also concluded that the consumption of animal protein is strongly anchored in the Dutch culture and the strong position of animal protein is the main barrier for increasing the consumption of meat substitutes and sustainably farmed fish (De Bakker & Dagevos, 2010). The lack of research towards consumer behaviour related to pulses in the Netherlands implies that pulses are not considered as an alternative for meat by the Dutch Government and the Dutch scientific world. In the study by Bakker and Dagevos (2010), which was funded by the government, eight more sustainable options were considered, namely: hybrid meat products, less polluting meat products, meal concepts with less meat, plant-based meat substitutes, sustainably farmed fish, biological meat, the meat of insects and less meat consumption. Beans and other vegetable proteins were, at that time, not even considered an option.

In a letter to the parliament, the Dutch Minister of Agriculture announced the development of a national protein strategy (Schouten, 2019). In the same letter, the current activities with regards to innovation and knowledge development focused on shifting to a more plant-based diet were specified. Most of these efforts are focused on products of mimicking meat (Schouten, 2019). The one effort focused on pulses specifically, a project called 'PULSE' orchestrated by the Dutch Science Council, is focused on the utilisation of pulse components as an ingredient in the food industry (NWO, 2020). It can be concluded that little or nothing is known about consumer behaviour with regards to pulses in the Netherlands.

1.9 Research around the World

In Finland, a number of studies were performed looking into the barriers to increasing pulse consumption. A survey performed under 350 Finnish university students found that price was perceived as the most relevant barrier to making climate-friendly food choices. This was followed by poor availability, lack of knowledge, and students experiencing difficulty in making climate friendly food choices (Mäkiniemi & Vainio, 2014). However, it was not price that had the highest inhibiting effect on actual food choice, which was disbelief in the negative impact of foods on the environment (Mäkiniemi & Vainio, 2014). In another study in Finland, which looked into the motives for shifting from animal protein to plant-based protein, from beef to beans, found out that concerns for the environment, personal health, and weight were the main motives in a shifting diet (Vainio, Niva, Jallinoja & Latvala, 2016). The main barriers inhibiting a shift were found out to be price and convenience (Vainio et al., 2016).

Another study into the perceived barriers to increasing pulse consumption in Finland found that 'not used to eating pulses', 'does not know pulse recipes', 'not interested in pulses' and 'pulses do not replace meat and fish' are the most perceived barriers to consumption (Niva, Vainio & Jallinoja, 2017). The authors argue that consumers need to be familiar with pulses in order for them to consider increasing consumption (Niva et al., 2017). Furthermore, health and environmental concerns are identified as motivational factors, whereas price and convenience are considered the main barriers (Niva et al., 2017).

In a survey conducted amongst 1048 15–64-year-old Finns, there was looked at consumption frequencies for different types of plant-based proteins, future intentions with regards to increasing bean consumption and prerequisites for increasing bean consumption. Also, a logistic regression analysis was performed between being a frequent consumer and several demographic characteristics, being a vegetarian, and perceptions regarding beans (Jallinoja, Niva & Latvala, 2016). Peas were most frequently consumed, followed by fresh or frozen green beans and dried or canned beans (Jallinoja et al., 2016). With regards to the future intention, 26% indicated they have not consumed and will not consume beans in the future, 2% indicated their consumption would increase, 52% indicated their consumption remained the same and 20% indicated their consumption would increase (Jallinoja et al., 2016). The respondents who consumed beans more frequently were more likely to increase consumption (Jallinoja et al., 2016). With regards to the prerequisites to increasing bean consumption, the most important prerequisites were knowing more bean recipes (54%), knowing more bean varieties (44%) and if the workplace canteen supplied bean meals (34%) (Jallinoja et al., 2016). Out of the logistic regression analysis, the following could be concluded: there is no significant difference in bean consumption based on gender, however, people within the age group 25-34 / higher education / a vegetarian diet are more likely to be frequent bean consumers (Jallinoja et al., 2016). Furthermore, perceptions that beans are a part of food culture, competence in preparing beans and finding beans tasty increased the likelihood of being a frequent consumer, where the environmental friendliness, healthiness, and beans being the cause for stomach pain has no significant influence on consuming beans more frequently (Jallinoja et al., 2016).

A study performed in Canada by Clark & Bogdan (2019) examining the role of plant-based foods, including pulses in various forms, in the Canadian diet also described the importance of familiarity. Canadians already consuming plant-based protein are more likely to try unknown varieties. Furthermore, this study also concludes that young Canadians with higher education are more likely to try new plant-based proteins Less-processed options like dry beans are preferred over more processed options like meat-substitutes Concerns for personal health and animal welfare have an effect on willingness to try new plant-based proteins where gender and income did not. Barriers to try new plant-based proteins are price, sensory characteristics, and perceptions that they are too processed and contain too much sodium (Clark & Bogdan, 2019).

In the United States (US) a number of studies have been conducted amongst low-income women with regards to the view on the nutrition and health benefits of pulses and attitudes and preferences regarding canned and dried beans (Heer & Winham, 2020; Winham et al., 2016; Winham et al., 2019). This target group was chosen because of the low diet quality of low-income women in the US and their families and the potential role beans could play in improving the diet quality (Heer & Winham, 2020; Winham et al., 2016; Winham et al., 2019).

The first of the studies looked at the knowledge about bean health benefits amongst low-income women in the US. Using a five-point Likert-scale, seven statements about beans were tested, namely, eating beans can…: improve your nutrition, help you feel full, lower bad cholesterol, lower cancer risk, control blood sugar, aid in intestinal health and help lose weight (Winham et al., 2016). The two items about nutrition (66%) and satiety (62%) were mostly agreed upon. On the statements about cholesterol (52%), cancer risk (54%), blood sugar (56%) intestinal health (40.8%) and weight management (49.6%) the responses were mostly neutral The average score on the 7 questions was 3.15% which indicates a neutral score on the awareness of the health benefits amongst low-income US women. The data was further analysed on ethnicity being Hispanic dominant, bicultural, and English dominant. More Hispanic dominant women 39% disagreed or disagreed strongly with the statement that consuming beans could help in weight loss compared to 26% bicultural and 16% English dominant where they were significantly less likely to believe in the statement about intestinal health (31%) compared to bicultural and English dominant (52% and 53%) Also, the more accultured the higher the knowledge of health benefits of beans.

The second of the studies tested consumption frequency, attitudes, and bean preferences amongst low-income women in the US. The study made a distinction between dry bean consumers and canned bean consumers (Winham et al., 2019). Of the responding women, 19,6% consumed beans once per month or less, 27,8% 2-3 times per month, 19% 1-2 times per week, 22,8% 3-4 times per week and 10,8% 5 or more times per week with the less accultured Hispanic women consuming significantly more often compared to bicultural and non-Hispanic white women. Of the respondents, 69% purchased dry beans and 66% purchased canned beans, with Hispanic women buying significantly more often dried beans and non-Hispanic white women buying significantly more often canned beans. The most preferred packaging was the small bags (32%) followed closely by a combination of loose and bags (29%). The most important traits for dry beans were price, tradition, and quality, whereas the most important canned bean traits were price, taste, and quality.
Furthermore, two attitude scales, consisting out of seven statements, rated on a five point Likert-scale, were tested, one for dry beans and one for canned beans. On a range from 0 to 28, the respondents scored 21 on the bean attitude scale with no difference for acculturation and 18,8 on the canned bean attitude scale with Hispanic women being less positive towards canned beans (Winham et al., 2019).

The last of the studies conducted in the US, looked at consumption frequency, purchasing patterns, and attitudes towards dry and canned beans of low income women by acculturation (Heer & Winham, 2020). Women who were less acculturated bought significantly more often dry beans, where more acculturated women bought significantly more quick-cooking or canned beans. Price was the most important trait for dry and canned beans. The same attitude scales as those used by Winham et al. (2019) were tested amongst the sample. The non-Hispanic white women and least acculturated Latinas had significantly lower attitude scores on both of the scales (Heer & Winham, 2020).

1.10 Defining the Research Problem

Within the Netherlands, pulse consumption is too low, only 35 grams a week (RIVM, 2017). National dietary guidelines recommend 135 grams a week for an adult (Voedingscentrum, 2020a). Other organisations recommend even higher weekly intakes. The USDA and Pulse Canada recommend a weekly intake of 300 grams (Pulse Canada, 2016; USDA, 2015), the WHO regards a diet low in legumes if less than 60 grams is consumed a day (James et al., 2018) and Willet et al. advise a daily consumption of 75 grams as part of a diet good for personal and planetary health (2019). Next to that, Dutch people are also least likely to replace meat with vegetables (De Boer & Aiking, 2018).

As of yet, nothing is known about consumer behaviour related to dried and canned pulses in the Netherlands. Exploring which factors affect Dutch pulse consumption might help government institutions and non-governmental organisations develop policies and campaigns to increase the consumption of pulses as recommended by the scientific world to increase dietary quality, help solve health inequity and help reduce the environmental impact of consumption in the Netherlands (Ranganathan et al., 2016; Willett et al., 2019). Therefore the proposed research question is:

"Which factors influence the consumption of dried and canned pulses amongst the general population in the Netherlands?"

In order to answer these questions, the following sub-questions will need to be answered:
- o What is the self-reported consumption frequency of dried and canned pulses amongst the general population in the Netherlands?
- o How does following a diet focused on reducing or avoiding meat consumption influence the consumption of dried and canned pulses amongst the general population in the Netherlands?
- o Does competence in preparing pulses have an influence on the consumption of dried and canned pulses amongst the general population in the Netherlands?
- o What is the relation between belief in the health benefits of pulses and the consumption of dried and canned pulses amongst the general population in the Netherlands?
- o What effect do certain attitudes have on the consumption of pulses amongst the general population in the Netherlands?
- o Is there a difference in preferred characteristics of pulses between different kinds of consumers in the Netherlands?
- o Which demographic factors influence the consumption of dried and canned pulses the most amongst the general population in the Netherlands?

The general research objective of this study is to collect information about factors affecting pulse consumption in the Netherlands.

The specific objectives are as follows:
- o To collect information about consumption frequency
- o To assess if a diet focused on reducing meat consumption influences pulse consumption
- o To identify if preferences, competence, attitudes, and perceptions act as barriers to pulse consumption
- o To assess the demographic profile of different kinds of pulse consumers

In the next chapter, the materials and methods used to answer the sub-questions and in the end, the main research question will be described.

2. Materials and Methods

In this chapter both the materials needed and the methods used will be described. In the section about materials, the population of the research will be described In the section about methods, the method of data collection will be described and per sub-questions, the to be measured variables will be provided. In the last section, the statistical analysis will be described.

2.1 Materials

The aim of this study was to identify some of the factors affecting pulse consumption amongst the general population of the Netherlands. This information could be used by government institutions, non-governmental organizations, and the pulse industry to improve their messaging and policies to increase the pulse consumption amongst the general population in the Netherlands.
The population of the Netherlands aged 15 and over was approximately 14,5 million (CBS, 2019a).
In order to determine the minimum sample size needed, the method described by Baarda (2014) was used. The minimum sample size was calculated for a confidence level of 95% (Baarda, 2014, p. 70).

*Minimum sample size = (1,96 / 0,05)^2 * 0,5 * 0,5 = 384*

The minimum sample size needed was 384.

2.2 Methods

The research was designed as a survey. In order to answer the sub-questions, quantifiable data was needed. A survey's objective is always to gather quantifiable information (Baarda, 2014). The method of data collection was a web-based questionnaire created in Google Forms. A questionnaire is a method used to find out the opinions and attitudes of respondents in vast numbers (Baarda, 2014). The advantages of this method of data collection are that data can be collected anonymously, provides respondents with no time-pressure, and that it is relatively low in cost (Baarda, 2014). The main disadvantage of a web-based questionnaire is that there will be much non-response (Baarda, 2014).

Data were collected during the period of a month with the first data collected on the 29th of June and the last data collected on the 26th of July. The questionnaire was spread through different kinds of social media, namely Facebook and LinkedIn. The questionnaire was posted on the personal account of the researcher. The questionnaire can be found in Appendix I in English and in Appendix II in Dutch. In Appendix III, the posting history and accompanying message can be found. Only the Dutch questionnaire has been posted since the target group of the research is the population of the Netherlands.

In order to ensure that a broad target group was reached, the questionnaire was posted in the 'International Food Business Alumni and Current Students' and 'Vraag en aanbod Aeres Hogeschool' Facebook groups. Also, several informants were used to spreading the survey amongst their respective networks. The accompanying message of the post included a friendly request to share the questionnaire. In total, the questionnaire was spread on 5 different dates at different times on Facebook and three times on Linkedin. In total, the posts were shared 29 times and thus spread in the following provinces: Noord-Holland, Zuid-Holland, Gelderland, Overijssel, Flevoland, and Groningen. Through the posts in the Facebook groups, all provinces of the Netherlands were reached. Now there will be described per sub-question what data will be collected.

In order to answer the first sub-question, data about the current canned and dried pulse consumption was collected. The answer options included: 'never', 'less often than once a year', 'a few times a year', 'once per month', '2-3 times per month', and 'at least once a week'. This question was adopted from a questionnaire performed in Finland (Jallinoja et al., 2016). Despite commentary that dietary self-report data suffer from a large measurement error, they provide valuable information about the consumption of populations which can help guide nutrition policies (Subar et al., 2015).

For the second sub-question, data about following a diet focused on reducing meat consumption was collected. The answer options included: 'flexitarian', 'vegetarian', 'vegan', and 'none of the above'. The question was modelled after research in Finland (Jallinoja et al., 2016). The answers were modelled after research in Finland and the Netherlands (De Bakker & Dagevos, 2010; Jallinoja et al., 2016).

For the third sub-question about competence, two statements were tested. The first was about competence in including pulses in a main dish. The second statement was about competence in preparing dried pulses. The first statement was based on research performed by Jallinoja et al. (2016). The second statement was based on research conducted by Winham et al. (2019). The answer options were a scale without a neutral point existing out of the following options 'fully disagree', 'disagree', 'agree' and 'fully agree'. The reason for this was that one either knows how to prepare and include pulses or one does not. Respondents can opt to go for the neutral option as an escape (Baarda, 2014).

For the fourth sub-question, about belief in the health benefits, a construct developed by Winham et al. (2016) was used The constructs tested seven statements about protruded health benefits of eating pulses. The statements all started with 'eating pulses can' followed by seven different health statements. The answer options were the same as used in the competence questions, however with an added neutral option. The construct measures the pulse health benefits knowledge of a population and had a Cronbach's alpha of 0,86 (Winham et al., 2016). Cronbach's alpha tests the homogeneity of a measurement instrument (Baarda, 2014). If Cronbach's alpha is higher than 0,7 it is generally accepted as a reliable measurement instrument (Kreulen, 2019). For this sample, the Cronbach's alpha tested 0,777.

For the fifth sub-question, about the relation between attitudes towards pulses and consumption, a number of attitudes were tested. The following statements were tested: 'pulses are tasty', 'eating pulses is good for the environment', 'eating pulses causes gas' and 'pulses are the poor man's meat'. These statements have been derived from research performed by Jallinoja et al. (2016) and Winham et al. (2019). The original list of attitudes of both the researches was longer, however, these have already been tested in the competence and health benefits section of the questionnaire. It was still relevant to look at these statements because these beliefs might negatively affect pulse consumption. These attitudes were tested using the same set up as the health benefits questions.

For the sixth sub-question, firstly there was asked what packaging types of pulses consumers purchase. Answer options included 'dried', 'cans', 'pots', so-called 'standing bags', I do not use pulses'. Furthermore, the types of pulses consumed were asked. Options included 'peas', 'beans', 'lentils', and 'chickpeas' as defined by Pulse Canada (2020). In order to measure the preferred characteristics, consumers were asked what product characteristics they take into consideration in buying pulses. The answer list included the following options: 'price', 'quality', 'nutritional value', 'taste', 'convenience', 'brand', 'familiarity', 'other', and 'I do not buy pulses'. These questions were adopted from research previously performed by Winham et al. (2019). Types of packaging were identified by visiting the

following supermarkets in Alkmaar: Albert Heijn, Lidl, and Deen. Lastly, a question was included in which respondents could give their motivations for or for not consuming pulses.

Lastly, the following demographic factors were collected: gender, age, and education. The answer options for gender include 'female', 'male', 'other', and 'rather not say'. With regard to age, the respondents will be able to fill in a number or leave it blank if they do not want to give their age. With regards to education, there will be inquired after the highest obtained degree the following options will be provided: 'primary school', 'high school', 'MBO', 'HBO or WO bachelor', 'Master or PhD'. Lastly, there will also be asked about the yearly income level of the respondents with the following answer options: 'less than €10.000', '€10.000 to €20.000', '€20.000 to €30.000', '€30.000 to €40.000', '€40.000 to €50.000' , '€50.000 to €100.000', 'More than €100.000' and 'rather not say'. These levels were selected based on numbers provided by the government (CBS, 2020a). In table 1, below, the question numbers are linked to their respective sub-questions.

Table 1 Links between sub-questions and the questionnaire

Sub-question	Responding questionnaire questions
What is the self-reported consumption frequency of dried and canned pulses amongst the general population in the Netherlands?	1
How does following a diet focused on reducing or avoiding meat consumption influence the consumption of dried and canned pulses amongst the general population in the Netherlands?	2
What is the role of competence in preparing pulses have an influence on consumption of dried and canned pulses amongst the general population in the Netherlands?	3-4
What is the relation between belief in the health benefits of pulses and the consumption of dried and canned pulses amongst the general population in the Netherlands?	5-11
What effect do certain attitudes have on the consumption of pulses amongst the general population in the Netherlands?	12-15
Is there a difference in preferred characteristics of pulses between different kinds of consumers in the Netherlands?	16-19
Which demographic factors influence the consumption of dried and canned pulses the most amongst the general population in the Netherlands?	20-23

2.3 Statistical Analysis

The data was analysed using SPSS version 26. First, the respondents were divided into groups based on their consumption frequency. These groups then were cross-tabulated with the answers to the other questions. Pearson's chi-square will be used to assess whether there is a significant correlation between the different components and pulse consumption. The totals of each health benefit statement were added up to create a scale measure. A one-way ANOVA was used to assess whether there was a significant correlation between the health benefits scale and pulse consumption.

3. Results

In this chapter, the results of the research will be reported. Firstly, the demographic characteristics of the sample will be described. Afterwards, all obtained relevant information needed to answer each sub-question will be presented. In total 321 people filled in the questionnaire. The minimum sample size of 384, as mentioned in chapter 2, was not obtained. Of those 321 people, 33% were men and 65% were women. The missing two per cent is made up of 4 people who entered the option 'rather not say' and two people who indicated 'other'. The mean age of the sample is 35,74 years. The age distribution is shown in figure 3 below.
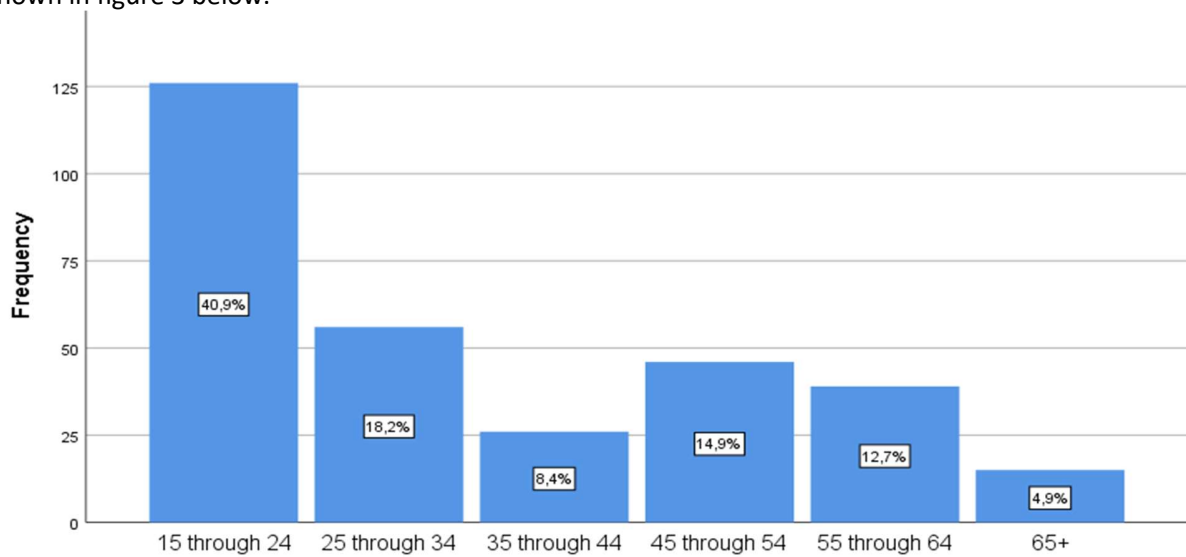
Figure 3 Age distribution amongst the sample

In the figure above the age distribution for the sample is shown. Thirteen respondents did not indicate age. Of the people who shared their age, 40,9% were between 15 and 24 years old, 18,2% were between 25 and 34 years old, 8,4% were between 35 and 44 years old, 14,9% were between 45 and 54 years old, 12,7% were between 55 and 64 years old and 4,9% were aged 65 and over.

In the pie-chart below the highest-obtained degrees are shown.
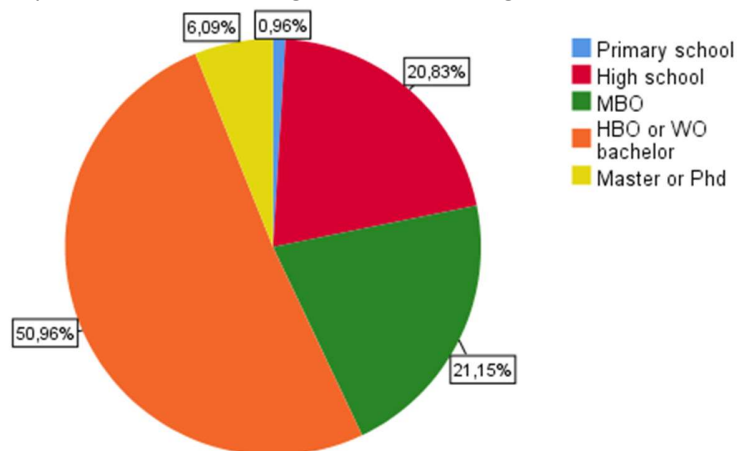
Figure 4 Highest-obtained degree

In figure 4 on the last page, the highest-obtained degrees of the respondents can be seen. Nine people indicated they would rather not share their highest-obtained degree. As figure 4 shows, 0,96% of the respondents had primary school as highest-obtained degree, for 20,83% this is high school, for 21,15% this is MBO (Dutch vocational education), for 50,96% this is an HBO or WO (University) Bachelor degree and six per cent obtained either a Master or a PhD. In the table below the yearly income of the respondents is shown.

In table 2 below, the income distribution of the sample is shown.

Table 2 Income distribution amongst the sample

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Less than €10.000	69	21,5	27,5	27,5
	€10.000 to €20.000	40	12,5	15,9	43,4
	€20.000 to €30.000	35	10,9	13,9	57,4
	€30.000 to €40.000	53	16,5	21,1	78,5
	€40.000 to €50.000	31	9,7	12,4	90,8
	€50.000 to €100.000	16	5,0	6,4	97,2
	More than €100.000	7	2,2	2,8	100,0
	Total	251	78,2	100,0	
Missing	Rather not say	70	21,8		
Total		321	100,0		

In the table above it can be seen that 70 of the respondents answered rather not say. Of the respondents who did give an income indication, 27,5% per cent earn less than €10.000, 15,9% earn between €10.000 and €20.000, 13,9% between €20.000 and €30.000, 21,1% between €30.000 and €40.000, 12,4% between €40.000 and €50.000, 6,4% between €50.000 to €100.000 and 2,8% earn more than €100.000.

In figure 5 below, is shown what percentage of respondents follow a diet focused on meat reduction.
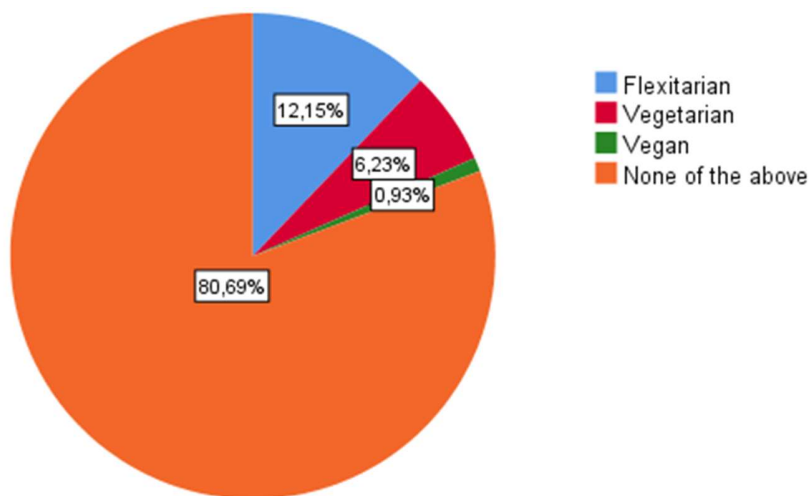
Figure 5 Percentage of the sample following a diet focused on meat reduction

In figure 5 on the last page, it can be seen that 12,15% of the respondents follow a flexitarian diet, 6,23% follow a vegetarian diet and three respondents (0,93%) follow a vegan diet. 80,69% of the respondents indicated they do not follow any of the before-mentioned diets. Because of their small size, vegetarian and vegan have been recoded into one for further statistical analysis.

3.1 Self-Reported Consumption Frequency of Dried and Canned Pulses

In table 3 below, the self-reported consumption frequency of the 321 respondents is depicted. Data are shown as a count and a percentage of the total.

Table 3 Self-reported consumption frequency of pulses

	Frequency	Per cent
Never	11	3,4
Less often than once a year	9	2,8
A few times a year	45	14,0
Once per month	59	18,4
2-3 times per month	112	34,9
At least once a week	85	26,5
Total	321	100,0

In table 3 above it can be seen that most respondents (34,9%) eat pulses 2 to 3 times per month. 26,5% eat pulses at least once a week. 18,4% eat pulses once per month and 14% a few times a year. Lastly, nine respondents (2,8%) eat pulses less than once a year and eleven respondents (3,4%) never eat pulses. The 'Never' and 'Less often than once a year' consumer groups have been recoded to one group, 'Less often than once a year'. The reasons for this include the small size and that both frequencies are very close to each other. The larger sample size of the combined group also allows to make a more valid comparison.

3.2 Influence of Meat-Reducing Diets on Pulse Consumption

In order to answer the second sub-question about the influence of meat-reducing diets on pulse consumption, the consumption frequency and diets have been cross-tabulated. In table 4 below, the correlation between pulse consumption and following a meat-reducing diet can be seen.

Table 4 Correlation between consumption frequency and meat-reducing diets

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Flexitarian	Count	1	1	7	12	18	39
	%	2,6%	2,6%	17,9%	30,8%	46,2%	100,0%
Vegetarian/ Vegan	Count	0	1	4	4	14	23
	%	0,0%	4,3%	17,4%	17,4%	60,9%	100,0%
None of the above	Count	19	43	48	96	53	259
	%	7,3%	16,6%	18,5%	37,1%	20,5%	100,0%
Total	Count	20	45	59	112	85	321
	%	6,2%	14,0%	18,4%	34,9%	26,5%	100,0%

In table 4 above, the correlation between pulse consumption frequency and following a meat-reducing diet can be seen. The counts and the percentages based on the total number of respondents following a flexitarian, vegetarian/vegan, or none of the before-mentioned diets are shown. This is different compared to the following cross-tabulations because the differences between the diets are shown more clearly. 60,9% of vegetarians/vegans consume pulses at least once a week compared to 46,2% flexitarians and 20,5% of the none of the above group. Furthermore, 17,4% of vegetarians/vegans and 30,8% of flexitarians consume pulses 2-3 times per month compared to 37,1% of the none of the above group. Pearson's chi-square indicates that there is a significant correlation between pulse consumption and following a meat-reducing diet (p=,000).

3.3 Influence of Competence on Pulse Consumption

The third sub-question looks to investigate the role of competence in including pulses in meals and in preparing dried pulses on pulse consumption. Both questions were tested on a 4-point Likert-scale ranging from fully disagree to fully agree with no neutral answer option. In table 5 below, the correlation between competence in including pulses in a main dish and pulse consumption is cross-tabulated.

Table 5 Correlation between consumption frequency and competence of preparing a main dish including pulses

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	5	1	3	2	0	11
	%	25,0%	2,2%	5,1%	1,8%	0,0%	3,4%
Disagree	Count	9	16	9	11	6	51
	%	45,0%	35,6%	15,3%	9,8%	7,1%	15,9%
Agree	Count	6	28	44	81	50	209
	%	30,0%	62,2%	74,6%	72,3%	58,8%	65,1%
Fully agree	Count	0	0	3	18	29	50
	%	0,0%	0,0%	5,1%	16,1%	34,1%	15,6%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

In table 5 above, the correlation between consumption frequency and competence of preparing a main dish including pulses is cross-tabulated. The counts and percentages based on the different consumption frequencies can be seen. It can be seen that most of the respondents feel competent in including pulses in a main dish (65,1% agree and 15,6% fully agree). The respondents who eat pulses at least once a week are a group that is most comfortable with including pulse in a main dish (34,% fully agree and 58,8% agree). The 2-3 times per month group has a lower percentage in the agree group compared to once per month (72,3% to 74,6%), however, they have a higher percentage in the fully agree group (16,1% to 5,1%).

The two lowest consumption groups have the lowest self-reported competence with respectively 62,2% and 30% of the respondents agreeing to be competent. The correlation is confirmed by Pearson's chi-square, which indicates that there is a significant correlation between pulse consumption and competence in including pulses in a main dish (p=,000).

In table 6 below the correlation between consumption frequency and competence in preparing dried pulses is depicted.

Table 6 Correlation between consumption frequency and competence of preparing dried pulses

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	13	13	12	16	8	62
	%	65,0%	28,9%	20,3%	14,3%	9,4%	19,3%
Disagree	Count	5	18	29	42	30	124
	%	25,0%	40,0%	49,2%	37,5%	35,3%	38,6%
Agree	Count	2	14	14	44	28	102
	%	10,0%	31,1%	23,7%	39,3%	32,9%	31,8%
Fully agree	Count	0	0	4	10	19	33
	%	0,0%	0,0%	6,8%	8,9%	22,4%	10,3%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

In table 6 above, the correlation between consumption frequency and the competence in preparing dried pulses is cross-tabulated. The counts and percentages based on the different consumption frequencies can be seen. It can be seen that most respondents do not feel competent about preparing dried pulses (38,6% disagree, 19,3% fully disagree). The lowest consuming group also feels least competent with 65% fully disagreeing. The group which consumes pulses a few times a year also mostly disagrees but less strongly (40% disagree and 28,9% fully disagree). The 2-3 times per month are almost split evenly with 48,2% agreeing or fully agreeing. The respondents who eat pulses at least once a week feel most competent with more than half (55,3%) agreeing or fully agreeing. The positive correlation is confirmed by Pearson's chi-square, which indicates that there is a significant correlation between pulse consumption and competence in preparing dried pulses (p=,000).

3.4 Influence of Belief in Health Benefits on Pulse Consumption

In order to test the belief in health-benefits, seven statements were protruded and tested on a 5-point Likert-scale ranging from fully disagree to fully agree. The third option was a neutral option with neither agree or disagree. In table 7 below, the mean scores for each of the statements are depicted.

Table 7 Mean scores of belief in health benefits

	'Eating pulses can improve your nutrition'	'Eating pulses can help you feel full'	'Eating pulses can lower bad cholesterol'	'Eating pulses can lower cancer risk'	'Eating pulses can help control blood sugar'	'Eating pulses can improve gut health'	'Eating pulses can help lose weight'
Mean	2,57	2,68	2,16	1,95	2,26	2,62	2,36

In table 7 above, the mean scores for each of the seven health benefit statements are given. The fully disagree option was coded as 0 and the fully agree option as 4. The mean score shows to what extent the 321 respondents agree or disagree with any of the protruded statements. The mean scores of the statements about nutrition, satiety, and gut health, with mean scores of 2,57, 2,68, and 2,62 respectively, indicate that respondents tend to agree with the statements. The respondents tend to answer neutral on the other four health benefits with mean values ranging from 1,95 to 2,36. The belief in the statement about cancer is the weakest with a mean value of 1,95.

In Appendix III all of the statements have been cross-tabulated against the consumption frequency. The majority of the responses on the statements about nutrition, satiety, and gut health was agree (48,3%; 55,5% and 51,1% respectively). For the other statements, the majority of the responses was neither agree nor disagree. The pattern which can be seen throughout each cross-table is that the higher the pulse consumption, the higher the belief in the specific health benefits. For example, for the second statement, about satiety, 78,9% of the highest consuming group responded with either agree or fully agree. In comparison for the two lowest consuming groups, this was respectively 57,8% and 35,5%.

When looking at the cross-table of the lowest scoring statement about cancer in Appendix III, it can be seen that 50% of the lowest consuming group disagrees or fully disagrees whereas the higher the consumption the more people either respond neutral or agree with 61,2% of the highest consuming grouping responding neutral and 23,5% either agreeing or fully agreeing. Similar patterns can be found for all of the other health statements. These positive correlations are confirmed by Pearson's chi-square, which indicates that there is a significant correlation between pulse consumption and an increasing belief in the health benefits (p=,000 for all statements).

As described in chapter two, the sum of the health benefits might also be used as a scale variable. In order to check whether the seven health benefit questions can be used as a scale metric, Cronbach's Alpha was performed. The outcome was, as described, 0,777 which indicates a good fit for the seven items. Due to the coding of the fully disagree as 0 and the fully agree as 4, the value of the scale can range between 0 and 28. A value of 14 would indicate a neutral belief in the health benefits of pulses.

In order to compare the outcomes of the health benefit scale between the different consumption frequencies, the means for each of the consumption frequencies has been depicted in table 8 below.

Table 8 Comparing health benefit scale means between consumption frequencies

Consumption Frequency	Mean	N	Std. Deviation
Less often than once a year	12,1500	20	4,13299
A few times a year	15,8667	45	2,37027
Once per month	16,4915	59	2,15257
2-3 times per month	16,9554	112	2,69931
At least once a week	17,6235	85	3,22924
Total	16,5950	321	3,08694

As can be seen in table 8 above, that the higher the consumption frequency the higher the mean value of the health benefit scale. All of the values are close to the neutral value of 14. However, the degree of neutrality varies. The consumption group of less often than once a year has a mean of 12,15 which indicates that it is less neutral as it is lower than 14. All of the other means are above 14 which indicates that they are more neutral and thus more positive. A one-way ANOVA indicated that there are significant differences between the means of the different consumption groups (P=,000).

3.5 Influence of Different Attitudes on Pulse Consumption

Next to the belief in health benefits, the influence of different attitudes of pulse consumption was tested. In table 9 below, the responses on the statement 'Pulses are tasty' are cross-tabulated against the different consumption frequencies in order to check for a correlation.

Table 9 Correlation between finding pulses tasty and consumption frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	6	1	0	2	0	9
	%	30,0%	2,2%	0,0%	1,8%	0,0%	2,8%
Disagree	Count	7	5	3	5	3	23
	%	35,0%	11,1%	5,1%	4,5%	3,5%	7,2%
Neither agree or disagree	Count	5	11	11	7	2	36
	%	25,0%	24,4%	18,6%	6,3%	2,4%	11,2%
Agree	Count	2	23	40	76	55	196
	%	10,0%	51,1%	67,8%	67,9%	64,7%	61,1%
Fully agree	Count	0	5	5	22	25	57
	%	0,0%	11,1%	8,5%	19,6%	29,4%	17,8%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

In table 9 on the last page, the correlation between consumption frequency and the responses on the statement 'Pulses are tasty' are cross-tabulated. The counts and percentages based on the different consumption frequencies can be seen. It can be seen that 94,1% of the highest consuming group of respondents either agrees or fully agrees with the statement. For the group which consumes pulses 2 to 3 times per month, this has decreased to 85,1%. Of the lowest consuming group, only 10% finds pulses tasty. Pearson's chi-square indicates that there is a significant correlation (p=,000) between consumption frequency and finding pulses tasty. In table 10 below the results for the second attitudinal statement, 'Eating pulses is good for the environment', are cross-tabulated against consumption frequency.

Table 10 Correlation between finding pulses good for the environment and consumption frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	7	1	0	1	0	9
	%	35,0%	2,2%	0,0%	0,9%	0,0%	2,8%
Disagree	Count	1	5	3	7	3	19
	%	5,0%	11,1%	5,1%	6,3%	3,5%	5,9%
Neither agree or disagree	Count	9	29	38	62	39	177
	%	45,0%	64,4%	64,4%	55,4%	45,9%	55,1%
Agree	Count	3	8	15	39	33	98
	%	15,0%	17,8%	25,4%	34,8%	38,8%	30,5%
Fully agree	Count	0	2	3	3	10	18
	%	0,0%	4,4%	5,1%	2,7%	11,8%	5,6%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

In table 10 above, the correlation between consumption frequency and the responses to the statement 'Eating pulses is good for the environment' are cross-tabulated. The counts and percentages based on the different consumption frequencies can be seen. More than half of the respondents (55,1%) responded neutral on this statement, 36,1% agrees and 8,7% disagrees. It can be seen that the higher the consumption frequency, the more people agree with the statement. Out of the highest consuming respondents, 50,6% either agrees or fully agrees with the statement, whereas this is only 15% of the lowest consuming group. Pearson's chi-square indicates that there is a significant correlation (p=,000) between consumption frequency and the level of agreement with the statement 'Pulses are good for the environment'.

Responses on the statement 'Eating pulses causes gas' are divided. 43,3% of the respondents agreed with the statement, 30,8% answered neutral and 25,9% disagreed. After performing Pearson's chi-square, no significant differences were found between the different consumption frequencies (p=,140).

In table 11 below, the responses on the statement 'Pulses are the poor man's meat' are cross-tabulated against the different consumption frequencies.

Table 11 Correlation between finding pulses 'poor man's meat' and consumption frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	0	8	7	18	20	53
	%	0,0%	17,8%	11,9%	16,1%	23,5%	16,5%
Disagree	Count	5	10	26	39	22	102
	%	25,0%	22,2%	44,1%	34,8%	25,9%	31,8%
Neither agree or disagree	Count	5	17	20	36	30	108
	%	25,0%	37,8%	33,9%	32,1%	35,3%	33,6%
Agree	Count	9	10	6	18	10	53
	%	45,0%	22,2%	10,2%	16,1%	11,8%	16,5%
Fully agree	Count	1	0	0	1	3	5
	%	5,0%	0,0%	0,0%	0,9%	3,5%	1,6%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

In table 11 above, the correlation between consumption frequency and the responses to the statement 'Pulses are the poor man's meat' are cross-tabulated. The counts and percentages based on the different consumption frequencies can be seen. In general, 48,3% disagreed or fully disagreed with the statement. 33,6% answered neutral and 18,1% agreed or fully agreed. The pattern which can be seen in the cross-table is that the more people consume the more people disagree with the statement. The lowest consuming group disagrees with 25%. The amount of disagreement steadily increases from 25% to 40% to 56% in the once per month consuming group. After that, the amount of disagreement stays around 50%. However, the number of people fully disagreeing increases with an increasing consuming frequency. Pearson's chi-square indicates that there is a significant correlation (p=,010) between consumption frequency and the level of disagreement with the statement 'Pulses are the poor man's meat'.

3.6 Differences in Preferred Pulse Characteristics between Consumption Frequencies

In order to understand the buying behaviour of people with different consumption frequencies, there was inquired about what types of packaging they use, what types of pulses they consume and what product characteristics they take into consideration when buying. For these questions multiple responses were possible. In table 12 below, the responses to the given options can be seen. People were also given an option to enter a different answer. These will be discussed below the table.

Table 12 Used Types of Pulse Packages per Consumption Frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Dried pulses	Count	2	9	24	41	41	117
	%	14,3%	20,9%	42,1%	39,0%	52,6%	
Canned pulses	Count	10	31	34	62	55	192
	%	71,4%	72,1%	59,6%	59,0%	70,5%	
Pots with pulses	Count	6	33	40	59	57	195
	%	42,9%	76,7%	70,2%	56,2%	73,1%	
Standing bags with pulses	Count	0	8	22	37	33	100
	%	0,0%	18,6%	38,6%	35,2%	42,3%	
Total	Count	14	43	57	105	78	297

In table 12, it can be seen that pots and cans with pulses are most commonly consumed with respectively 195 (65,66%) and 192 (64,65%) responses of the 297 who responded on the given options. Furthermore, with increasing consumption, people also tend to consume dried pulses and standing bags more frequently. Amongst the respondents who only eat pulses less often than once a year canned pulses are the most chosen option (71,4%). Next to that, 14 respondents indicated that they buy fresh pulses and 15 respondents indicated that they bought frozen pulses. Two other answers are given where pulses in a paper bag (twice) and hummus (once).

In table 13, the different types of pulses consumed are cross-tabulated against consumption frequency.

Table 13 Types of Pulses Consumed per Consumption Frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Beans	Count	13	41	58	104	83	299
	%	86,7%	91,1%	98,3%	93,7%	97,6%	
Lentils	Count	1	10	30	42	45	128
	%	6,7%	22,2%	50,8%	37,8%	52,9%	
Peas	Count	3	25	39	88	75	230
	%	20,0%	55,6%	66,1%	79,3%	88,2%	
Chick peas	Count	1	15	26	54	59	155
	%	6,7%	33,3%	44,1%	48,6%	69,4%	
Total	Count	15	45	59	111	85	315

Of the 315 respondents who responded on at least one of the options, 299 indicated that they consume beans followed by 230 who indicate to consume peas. Chickpeas (155) and lentils (128) are the least chosen options. Beans are popular amongst all consumption frequencies with percentages ranging from 86,7 to 98,3. For lentils peas and chickpeas, seem to be more consumed amongst the groups with a higher consumption frequency. Next to that, seven people indicated that they don't consume pulses at all.

In table 14 below, the preferred product characteristics are depicted per consumption frequency.

Table 14 Preferred Product Characteristics per Consumption Frequency

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	
Price	Count	10	23	35	63	46	177
	%	71,4%	52,3%	60,3%	57,3%	56,1%	
Quality	Count	4	20	32	69	54	179
	%	28,6%	45,5%	55,2%	62,7%	65,9%	
Nutritional value	Count	0	3	8	32	25	68
	%	0,0%	6,8%	13,8%	29,1%	30,5%	
Taste	Count	3	20	27	64	54	168
	%	21,4%	45,5%	46,6%	58,2%	65,9%	
Convenience	Count	3	15	29	52	41	140
	%	21,4%	34,1%	50,0%	47,3%	50,0%	
Brand	Count	3	9	10	8	14	44
	%	21,4%	20,5%	17,2%	7,3%	17,1%	
Familiarity	Count	1	9	14	25	19	68
	%	7,1%	20,5%	24,1%	22,7%	23,2%	
Total	Count	14	44	58	110	82	308

In table 14, the preferred product characteristics per consumption frequency can be seen. In general, quality (58,1%), price (57,5%), taste (54,5%) and convenience (45,5%) were the most important characteristics. For the lowest consuming group, price is by far the most important characteristic (71,4%). For the second least consuming group the preferred characteristics are less distinct, with price (52,3%) and taste and quality (both 45,5%). For the middle consuming group this is similar (price 60,3%, quality 55,2% and taste 46,6%). Next to that, convenience also seems to be a relevant characteristic (50%) for the middle group. Price (57,3%), quality (62,7%), taste (58,2%), and convenience in a lesser amount (47,3%), are the most chosen characteristics for the second most consuming group. For the highest consuming group, quality, and taste (both 65,9%) are the most chosen product characteristics followed by price (56,1%) and convenience (50%). Brand and familiarity are the least chosen options with no distinct differences between consumption frequencies. Nutritional value is also one of the least chosen options. However, with an increased consumption frequency the nutritional value seems to become more relevant with 30,8% of the most frequent consumers selecting it. The same seems to be true for the product characteristics taste and quality. Ten people indicated that they do not buy pulses. Of the other options presented six respondents indicated that they take the origin of their pulses into consideration, whether it is organic or grown in the Netherlands or a combination of the two. In the following question, there was inquired about reasons for not buying pulses. Eight respondents indicated that they do not buy pulses. Six of them indicated that they do not like to eat pulses, one indicated not knowing the reason why and one left the answer space blank.

3.7 Influence of Demographic Factors on Consumption Frequency

The following demographic information was collected: age, gender, education, and income. All of these were cross-tabulated against consumption frequency and a Pearson's chi-square was performed in order to check for significance. No significant correlations were found for age (p=0,558), gender (p=0,158), education (p=0,415) and income (p=0,062). In the next chapter, the results will be compared to other findings and will be critically discussed.

4. Discussion of Results

In this chapter, the results are discussed. The general research objective of this study was to collect information about factors affecting pulse consumption in the Netherlands.

The specific objectives were as follows:
- o To collect information about consumption frequency
- o To assess if a diet focused on reducing meat consumption influences pulse consumption
- o To identify if preferences, competence, attitudes, and perceptions act as barriers to pulse consumption
- o To assess the demographic profile of different kinds of pulse consumers

The pulse consumption frequency observed in this study seems to be higher than the average Dutch pulse consumption observed by the RIVM (2017). Furthermore, meat reducing diets, competence, perceived health benefits, and a number of attitudes were correlated with an increased consumption frequency. Surprisingly, demographic factors were found not to be of significant influence on consumption frequency. The perception of pulses causing gas was found to be of no significance as well. People with a higher pulse consumption also seemed to consume dried pulses and standing bags with pulses more often. Next to that, they also tended to eat more different types of pulses. The most important characteristics were price, quality, taste, and convenience. The importance of preferred characteristics seems to vary between the different frequencies of consumption.

The sample and methodology will be discussed before each of the sub-questions will be discussed separately. In table 15, below the demographic characteristics of the sample are compared to the general population of the Netherlands

Table 15 Sample compared to the Dutch population (CBS, 2020a)

		Sample	Dutch population
Gender	Man	33,4%	49,7%
	Woman	65,9%	53,3%
	Other	0,6%	N/A
Age	15-24	40,9%	12,3%
	25-34	18,2%	12,7%
	35-44	8,4%	11,9%
	45-54	14,9%	14,5%
	55-64	12,7%	13,5%
	65+	4,9%	19,3%
Education	Primary school	1,0%	8,4%
	High school	20,8%	28,8%
	MBO	21,2%	27,9%
	HBO or WO bachelor	51,0%	20,9%
	Master or PhD	6,1%	12,4%

Income	< €10.000	27,5%	21,5%
	€10.000 to €20.000	15,9%	11,3%
	€20.000 to €30.000	13,9%	12,0%
	€30.000 to €40.000	21,1%	12,4%
	€40.000 to €50.000	12,4%	11,7%
	€50.000 to €100.000	6,4%	25,5%
	> €100.000	2,8%	4,9%

In table 15 it can be seen that compared to the general population of the Netherlands, this research had an overrepresentation of women. This could indicate that women are more likely to fill in a web-based questionnaire compared to men. Next to that, this research also had an overrepresentation of people aged between 15 and 35 and an underrepresentation of people aged 65 and over. This could be linked to the network of the researcher in which the questionnaire was initially shared. This network mostly consists of peers aged between 15 and 35. However, informants who shared the questionnaire were partially from an older age group. The underrepresentation of the 65+ demographic might be caused by this specific demographic's lack of activity on social media, or them being less willing to share information online.

With regards to education, it can be seen in table 15, that there was an overrepresentation of people with a bachelor's degree. This could be caused by multiple factors. First of all, the groups in which the questionnaire was posted mostly exist out of alumni or current students of the Aeres University of Applied Sciences and the International Food Business program. Second of all the researcher's peers are either still studying or young professionals. Next to that, the question was framed as the highest obtained degree, however, people could have also entered the degree they are currently obtaining. Further elaboration on the question could have been added in the questionnaire in order to make clear that the obtained degree was meant.

With regards to income, an overrepresentation can be seen in the < €10.000 and €30.000 to €40.000 groups and an underrepresentation in the groups earning more than €50.000 can be observed. This could be due to the fact that a lot of the respondents seem to be either still be students (< €10.000) or just starting a career with their bachelor degree (€30.000 to €40.000). Furthermore, 70 missing values (rather not say) were noted. People with a higher income might be less likely to share details about their income in a web-based questionnaire.

The minimum sample size needed to make valid conclusions for the whole Dutch population was 384. In total 321 people reacted to the questionnaire. There are several things that could have been done differently in order to get more respondents and a better representative sample for the Dutch population. First of all, a combination of different data collection methods could have been used. For example, in order to reach the older demographic, surveying could have been done on random streets in random places at random times. Also, the questionnaire could have been posted in a larger variety of social media groups. Lastly, companies could have been asked to share the questionnaire amongst their employees and on their social media. Next to doing more, the respondents could also have been incentivized by given the chance to win a prize if they filled out the questionnaire. Because of the minimum sample size not being obtained and several over and under representations in the sample, the conclusions in this report cannot be applied to the general population in the Netherlands. However, conclusions in this report can apply to the sample and the different consuming groups in this research.

Using Google Forms to distribute the questionnaire initially seemed like the best option since it is free and easy-to-use. However, the output of the results of the questionnaire was all nominal. This made it difficult to process the results in SPSS. Manual recoding was needed in order to make the results more digestible for SPSS. In hindsight, another tool might be better-suited for consumer research.

Due to the limitations of this research, the results of this research only apply to the population of the Netherlands and its different pulse consuming groups. The findings of this research cannot be applied to, for example, France or the UK, because this research focuses on consumers. In every country, consumers behave differently due to cultural background, traditions, and even the climate. In marketing research, different dimensions need to be taken into consideration for every country (Mooij, 2017). So, the results cannot be used in other countries. However, the methodology of this research can be applied to other countries.

4.1 Self-Reported Consumption Frequency of Dried and Canned Pulses

Self-reported consumption is always prone to over-reporting but still can provide valuable information about consumption patterns (Subar et al., 2015). Furthermore, because of the questionnaire being web-based, the risk that respondents give social desirable answers is reduced because there is no face to face interaction (Baarda, 2014). The Dutch National Consumption Survey found that pulses are eaten once per 3 weeks on average in the Netherlands (RIVM, 2017). More than 50 per cent (61,4%) of the sample ate pulses more than average (34,9% '2-3 times per month', 26,5% 'at least once a week'). Next to that, 18,4 per cent ate pulses once per month, which is close to the national average. It can not be said with certainty that pulse consumption in the sample is higher than the national average because the answers were pre-defined. However, in this sample, it seems that pulse consumption is above the average observed by the RIVM (2017).

Compared to the results of Winham et al., consumption in this sample is similar to that of the non-Hispanic white women (2019). 38,6 per cent of the respondents eat pulses once per month or less, compared to 33,3 per cent of the non-Hispanic white women, 34,9 per cent ate pulses 2-3 times per month, compared to 37,9 per cent. However, the demographic factors of these groups are not comparable. Winham et al. only interviewed women with low-income (2019).

The research by Jallinoja et al. amongst 15-64 year old Finns (2016) gave a better ground for comparison (2016). Their research focused on consumption frequencies of different plant-based protein sources including dried or canned beans. In table 16 below the results of Jallinoja et al (2016) are compared to the results of this research.

Table 16 Results compared to Finnish dried or canned bean consumption (Jallinoja et al., 2016)

	Never	Less than once a year	A few times a year	Once a month	Two or three times a month	At least once a week
Results of this research	3,4	2,8	14,0	18,4	34,9	26,5
Dried or canned beans	22	18	28	14	12	6

As can be seen in the table above, the pulse consumption of this sample is higher compared to the canned and dried bean consumption in Finland. It has to be noted that the sample of Jallinoja et al. is more representative of the general population in Finland with only a slight overrepresentation of women and an overrepresentation of obtained master degrees (2016). Taking into consideration these differences, the difference in consumption frequency is still obvious.

4.2 Influence of Meat-Reducing Diets on Pulse Consumption

Of the respondents, 7,2 per cent indicated to be either vegetarian or vegan, 14,1 per cent identified as flexitarian, and 80,7 did not identify as either of them. This is highly in contrast with earlier findings were 4,0 per cent classified as meat-avoider (vegan and vegetarian), 69,5 per cent as meat reducer (comparable to flexitarian) and 26,5 as meat avoider (De Bakker & Dagevos, 2010). This could be due to the fact that people are not aware of the definition of a flexitarian. This could have been better explained in the questionnaire. Nevertheless, a significant correlation (p=,000) was found between following a diet focused on meat reduction and more frequent pulse consumption. Compared to people who did not identify as any of the opted diets, flexitarians and vegetarians/vegans in a greater amount, tend to eat pulses more often. This finding is in line with the findings of Jallinoja et al. who found that vegetarians/vegans are more likely to eat pulses more frequently (2016). This is also in line with a study performed in Canada, where being a vegetarian was linked to higher consumption of plant-based proteins and a higher willingness to try new ones (Clark & Bogdan, 2019).

4.3 Influence of Competence on Pulse Consumption

Most people feel able to include pulses in a main dish, 80,7 per cent agreed or fully agreed with the protruded statement. Fewer people feel able to prepare dried pulses, 42,1 per cent agreed or fully agreed. In reality, these numbers could be lower since it is more socially desirable to admit than to deny a skill. However, this has been minimized by making the survey web-based and by not offering a neutral option as an escape (Baarda, 2014).

Both the competence in including pulses and preparing dried pulses had a significant correlation (p=,000 for both) with pulse consumption frequency. An increased feeling of competence was related to an increased consumption frequency. Research in Finland also found an increased competence to be related to more frequent bean consumption (Jallinoja et al., 2016). In the US, a study found that competence in preparing dried beans was a source of frustration for study participants (Winham et al., 2019). Another study, performed in Finland, concluded that competence is one of the main barriers to increasing plant protein consumption in a meat-eating society (Niva et al., 2017). Being able to prepare and include pulses has an influence on the pulse consumption frequency.

4.4 Influence of Belief in Health Benefits on Pulse Consumption

Most respondents were unaware of most of the health benefits pulses have to offer. The statements about improved nutrition, satiety, and gut health were mostly accepted by the respondents. However, the mean scores of the statements about lowering cancer risk, lowering bad cholesterol, controlling blood sugar, and helping lose weight, indicated unawareness about the benefits. Most people answered 'neither agree nor disagree' on those statements. The same was also seen in a study amongst low-income women in the US (Winham et al., 2016). The tendency was also the higher the impact of a benefit, the lower the confidence in the protruded statement. That tendency is best portrayed by cancer having the lowest mean score. However, for all of the statements, and increased consumption frequency correlated significantly (p=,000 for all statements) with a more positive attitude towards the protruded health benefits.

This also showed in the analysis of the health benefits scale. The means for the consumer groups ranged from 12,2 for the least frequent to 17,6 most frequently showed a significant relation (p=,000). In a study amongst low-income US women, the conclusion was similar. Most respondents were unaware of the specific health benefits of pulses (Winham et al., 2016). Another study contradicts the influence of healthiness on an increased consumption frequency. Jallinoja et al. found that the healthiness of pulses was not a significant factor in increasing pulse consumption (2016) Niva et al. found that personal health can be a motivational factor in increasing pulse consumption (2016). Increasing the belief in the health benefits could lead to increased consumption of pulses.

4.5 Influence of Different Attitudes on Pulse Consumption

In total four attitudinal statements were tested in this research. The first of them tested whether or not respondents found pulses to be tasty. It is logical that if one finds something tasty, consumption will increase. This can also be seen in the results; only 10 per cent of the lowest consuming group found pulses tasty compared to 94,1 per cent in the highest consuming group. The correlation between liking the taste of pulses and more frequent consumption was proved to be statistically significant (p=,000). Next to that, six of the respondents who do not consume pulses indicated that not liking the taste was their main reason for not consuming pulses. Similar results were found amongst the general population of Finland, where finding beans tasty was a predictor for increased pulse consumption (Jallinoja et al., 2016). In the Netherlands and the UK, taste was found to be an important barrier to the acceptance of meat substitutes (Hoek et al., 2011). Taste is also considered an important product characteristic of canned beans in the US (Winham et al., 2019). In Canada taste was found to be a motivational factor to consume more plant-based proteins (Clark & Bogdan, 2019). Finding pulses tasty, is, therefore, a major influence on pulse consumption.

Although the scientific world recognizes the environmental benefits of pulses (Ranganathan et al., 2016; Willett et al., 2019), the respondents tended to react more neutral to the environmental friendliness of pulses, with over 50 per cent reacting neutral on the statement. Only 8,7 per cent disagreed with the statement. A significant part of the respondents agreed with the statement. A significant correlation was found between believing in the environmental friendliness of pulses and a more frequent consumption (p=,000). However, this correlation was less strong compared to taste, 15 per cent of the lowest consuming group agreed compared to 57,6 per cent of the highest consuming group.

Results in Finland indicated that environmental concerns did not have a significant influence on pulse consumption (Jallinoja et al., 2016). However, other studies identify environmental concerns as important individual motivational factors (Clark & Bogdan, 2019; Niva et al., 2017). Finding pulses environmentally friendly is of influence on the consumption frequency. Other studies suggest that it is mostly a motivational factor.

Pulse consumption causing intestinal gas was found to have no significant influence on the consumption frequency (p=,140). In a study performed in Finland, beans being the cause of stomach pain was also found to have no significant influence on bean consumption (Jallinoja et al., 2016).
where the environmental friendliness, healthiness, and beans being the cause for stomach pain have no significant influence on consuming beans more frequently (Jallinoja et al., 2016). A study performed in 2011, already concluded that the perception of an increase in flatulence associated with pulses is exaggerated. In a series of feeding studies with consumption of half a cup of beans a day, only 11 per cent of participants reported increased flatulence (Winham & Hutchins, 2011). This study and past research confirm that pulses causing gas is of non-significant influence on consumption frequency.

The last attitudinal statement was concerned with the perception of pulses being the meat for the poor. The perception of beans being the poor man's meat seems to be obsolete. Only 18,6% of the respondents agreed or fully agreed with the statement. In a study performed in the US amongst low-income women, only 5,2 per cent agreed with the statement (Winham et al., 2019). However, it was found that perceiving pulses as the poor man's meat, correlates significantly with a lower pulse consumption frequency (p=,010). In order to increase pulse consumption amongst the lower consuming groups, this belief needs to be disarmed.

4.6 Differences in Preferred Pulse Characteristics between Consumption Frequencies

In this research, three different multi-response questions were posed to the respondents. The first of them was about the packaging type used, the second one about what type of pulse was consumed and the third one was about the characteristics taken into consideration when purchasing pulses. The downside of testing multi-response questions is that they are difficult to prove statistically significant. In SPSS 26, when cross-tabulating multi-response questions, no statistical tests were offered. Therefore, the analysis of these questions was limited to relative percentages and observed trends within the cross-tabulations.

Potted and canned pulses are the most popular packaging types amongst all consumption frequencies. However, increased consumption of pulses seemed to also increase the use of dried pulses and of the novel packaging standing bags. This trend corresponds with findings in Finland, where it was found out that the consumption of plant protein seems cumulate, with frequent bean consumers eating a wider variety of plant protein sources (Jallinoja et al., 2016). Findings in Canada, also support this trend, where it was found that past and current consumption were good predictors of future consumption and an increased willingness to try new plant-based protein sources (Clark & Bogdan, 2019). In a study in the US, bags and loose packaging was preferred (Winham et al., 2019). However, only the preferred packaging for dried pulses was researched.

Respondents were also given the option to give a different answer. 15 respondents indicated to buy fresh pulses and 14 respondents indicated to buy frozen pulses. However, it is unclear whether these answers fall under the definition of pulses used in this research. If by fresh, fresh green peas were meant, this does not fall under the definition used. These products fall under the green vegetables. The same counts for frozen green peas. If by fresh was meant that pulses were bought at a local producer, it could be that the bought pulses fall under the definition used. This confusion could be caused by the construct of the questionnaire. The definition was mentioned at the beginning of the questionnaire. However, for clarity reasons, the definition could have been repeated before the multi-response questions.

Beans were the most popular type of pulse used regardless of consumption frequency. Beans were closely followed by peas, however, differences were observed between the different consumption frequencies. In Finland, it was found that peas were the most popular pulse, followed by beans (Jallinoja et al., 2016). With regards to peas, chickpeas, and lentils, a similar trend as with the packaging types was observed. The higher the consumption frequency, the higher the popularity of these pulses amongst respondents. As discussed for the standing bags and dried pulses before, this finding was in line with previous research conducted in Canada and Finland, where bean consumption was linked to an increased willingness to try a wider variety of plant protein products (Clark & Bogdan, 2019; Jallinoja et al., 2016).

Quality, price, taste, and convenience were found to be the most important characteristics. This is similar to results amongst low-income women in the US, where price and quality were the most important traits for dried beans and price, quality, and taste for canned beans (Heer & Winham, 2020; Winham et al., 2019). However, differences were found between the different consumption frequencies. Price was found to be by far the most important characteristic of the lowest consuming group. This is in line with other findings, were it was found that price is one of the main barriers in a shift from beef to beans (Clark & Bogdan, 2019; Mäkiniemi & Vainio, 2014; Niva et al., 2017; Vainio et al., 2016). That price is an important characteristic and acts as a barrier to increased consumption seems to be supported by the findings and other research. However, other studies found that compared to their nutritional content, pulses provide excellent value for money (Drewnowski, 2010b, 2010a; Zanovec et al., 2011). Although price is a perceived barrier, pulses are actually affordable plant protein sources. This perception could easily be disproven.

The importance of taste and quality seemed to increase with an increased consumption frequency. For the non-consumers of pulses, 6 of the 8 indicated that their reason for not consuming is their disliking of the taste. The importance of finding pulses tasty was supported by a study in the Netherlands and the UK. It was found that for non-consumers of meat substitutes one of the main barriers to consumption was the low sensory appeal (Hoek et al., 2011). Clark & Bogdan, also found that a barrier to plant protein consumption were the sensory characteristics (2019). Improving the sensory appeal of pulses could thus lead to increased consumption.

4.7 Influence of Demographic Factors on Pulse Consumption

No significant correlation was found between demographic factors and consumption frequency. However, this does not mean that there are not any amongst the general Dutch population. As earlier discussed this sample had an overrepresentation of women, young people, people with a bachelor's degree, and people in the low and medium income brackets. Next to that, a lot of missing values were registered for income. Before the 'rather not say' answer was coded as a missing value, a significant correlation was found. However, this would have distorted the results and not be representative of actuality. Also, the minimum sample size of 384, was not achieved. Therefore, there it cannot be concluded that demographic factors do not have any influence on pulse consumption frequency. Especially, since in other countries, significant relations were found. In Finland, frequent bean consumption was most likely among persons aged 25–34, living around the capital district, with education higher than comprehensive or vocational school, and who were vegetarian (Jallinoja et al., 2016). In Canada, young people with higher education were found to be more likely to try new plant-based proteins (Clark & Bogdan, 2019). Thus, the influence of demographic factors on pulse consumption can not be ruled out based on this research, although no influences were found.

Another major shortcoming of this research was the fact that the questionnaire did not take into account the diversity of the population of the Netherlands. On the first of July, 2020, 24,4 % of the population of the Netherlands had a migration background. By migration background was meant either first or second generation immigrant. In the capital of the Netherlands, the city of Amsterdam, this number was even 55,6%. Most of the immigrants come from Turkey, Morocco, Suriname, Indonesia, Germany and Poland (CBS, 2020b). No question about ethnicity was included in the demographic part of the questionnaire. Considering the diversity of the Dutch population, such a question should have been included.

5. Conclusions and Recommendations

Currently, dietary patterns around the world are harmful to the environment and for people's health and well-being. Potentially, increasing pulse consumption could lower the environmental impact of diets and solve health inequity (Ranganathan et al., 2016; Willett et al., 2019). The objective of this research was to identify factors that influence pulse consumption in the Netherlands. Using a questionnaire, the following factors were tested: following a meat-reducing diet, competence, belief in health benefits, different attitudes towards pulses, preferred pulse characteristics, and demographic factors. Although the results of this research cannot be extrapolated to the general population, they provide valuable insights about factors affecting people's pulse consumption frequency in the Netherlands. Now, each sub-question will be answered individually before answering the main research questions.

What is the self-reported consumption frequency of dried and canned pulses amongst the general population in the Netherlands?
Results suggest that this sample has a pulse consumption above the average observed by the RIVM (2017). The majority of this sample, 61,4%, consumes pulses '2 to 3 times a month' or at least 'once a week'. With the average in the Netherlands being once in 3 weeks this result suggests that the average pulse consumption of this sample is above the average in the Netherlands. Comparing the findings internationally, this sample had a higher pulse consumption than the sample in Finland (Jallinoja et al., 2016). The consumption of this sample is comparable to that of the non-Hispanic white women in the study by Winham et al., but not to the more accultured Hispanic women (2019).

How does following a diet focused on reducing or avoiding meat consumption influence the consumption of dried and canned pulses amongst the general population in the Netherlands?
Respondents indicating that they follow a diet focused on reducing the amount of meat consumed (ergo vegan, vegetarian or flexitarian), have a higher pulse consumption frequency in this sample. Similar conclusions have been drawn in Canada and Finland (Clark & Bogdan, 2019; Jallinoja et al., 2016). If combined with grains pulses can provide all the amino-acids which are found in meat as well (Havemeier et al., 2017). This makes pulses a great alternative for people who want to consume less meat and might explain the found correlation.

Does competence in preparing pulses have an influence on consumption of dried and canned pulses amongst the general population in the Netherlands?
Competence, expressed as being able to include pulses in a main dish and being able to prepare dried pulses, is also correlated with a higher pulse consumption frequency. In Finland, similar results were found (Jallinoja et al., 2016). Next to that, in both Finland and the US, not feeling competent in preparing pulses was found to be a barrier for people to increase their consumption (Niva et al., 2017; Winham et al., 2019). So, increasing the competence of consumers can positively affect pulse consumption.

What is the relation between belief in the health benefits of pulses and the consumption of dried and canned pulses amongst the general population in the Netherlands?
Most respondents were unaware of the specific health benefits related to pulses. This was also the case in the US amongst both non-Hispanic white and Hispanic women (Winham et al., 2016). However, still, an increased belief in the health benefits of pulses was significantly correlated with a higher pulse consumption as was the case in the US (Winham et al., 2016). Therefore, making people aware of the health benefits of the pulse could have a positive effect on people's pulse consumption.

What effect do certain attitudes have on the consumption of pulses amongst the general population in the Netherlands?

A number of attitudes had a significant correlation with increased pulse consumption frequency. Finding pulses tasty was strongly correlated with a higher pulse consumption. In Canada and Finland, taste was found to be a motivational factor (Clark & Bogdan, 2019; Jallinoja et al., 2016), whereas in the Netherlands and the UK taste was found to be a major barrier to increasing consumption (Hoek et al., 2011). Therefore, low sensory appeal of pulses is a major barrier to increasing pulse consumption, whereas finding pulses tasty is a predictor for increased pulse consumption.

Respondents who recognized the environmental friendliness of pulses also had a significantly higher consumption frequency of pulses. However, this effect was less strong than that observed in taste. These findings do not correspond with findings in Finland, where no significant influence of environmental concerns on pulse consumption (Jallinoja et al., 2016). However, environmental concerns were found, by other studies, to be a motivational factor for pulse consumption (Clark & Bogdan, 2019; Niva et al., 2017). Based on the results and the literature review, it can be concluded that environmental concerns are a motivational factor for pulse consumption.

The view of pulses as 'poor man's meat' was significantly correlated with a lower pulse consumption frequency. In this research and that of Winham et al. the majority of the respondents did not agree at all with the statement (2019). However, this view on pulses seems to be strongly present amongst the lowest consumption frequency. Therefore, it can be concluded that this view acts as a barrier to increasing pulses consumption.

Is there a difference in preferred characteristics of pulses between different kinds of consumers in the Netherlands?

The most common packaging type used are potted and canned pulses and the most common type of pulse consumed are beans. These findings do not correspond with findings in Finland (Jallinoja et al., 2016). However, with an increased consumption frequency, respondents tended to use more different packaging and pulse types. This pattern was also observed in both Finland and Canada (Clark & Bogdan, 2019; Jallinoja et al., 2016). Therefore, it can be concluded, for the Netherlands, that the higher the pulse consumption, the higher the variety of pulse products consumed.

Quality, price, taste and convenience were the most important product characteristics for buying pulses in this Sample. Based on this research and findings in Finland, Canada, the UK, and the Netherlands, price and a low sensory appeal act as barriers to increasing pulse consumption amongst the sample (Clark & Bogdan, 2019; Hoek et al., 2011; Mäkiniemi & Vainio, 2014; Niva et al., 2017; Vainio et al., 2016).

Which demographic factors influence the consumption of dried and canned pulses the most amongst the general population in the Netherlands?

No demographic influences on pulse consumptions were found. However, because of the limitations of this research influence of demographic factors on pulse consumption cannot be ruled out. Especially, because in Finland and Canada demographic factors had an influence on the consumption of pulses and plant based proteins (Clark & Bogdan, 2019; Jallinoja et al., 2016).

The main research question of this bachelor thesis was: *"Which factors influence the consumption of dried and canned pulses amongst the general population in the Netherlands?"*

Based on this research and supported by research conducted in other countries, several factors were found to have an influence on dried and canned pulses amongst the general population in the Netherlands. Being vegetarian, vegan, or flexitarian is linked to increased pulse consumption, as is feeling more competent in preparing pulses. An increased belief in health benefits was correlated with an increased pulse consumption, even with most of the sample being unaware of the health benefits. Consuming pulses also has been linked positively with consuming a larger variety of pulses. Finding pulses tasty is a predictor for increased pulse consumption, whilst disliking the taste of pulses acts as a barrier to increasing pulse consumption. Other barriers to increasing pulse consumption were found to be price and the view of pulses being 'poor man's meat'. Environmental concerns act as a motivational factor for pulse consumption. Based on this research, no conclusions can be made on the role of demographic factors on pulse consumption.

Based on this research long and short term recommendations can be made. These recommendations cover every stakeholder in the pulse industry. These stakeholders are companies that grow, process, or sell pulses such as HAK or Bonduelle but also interest groups and the Dutch government. All these different players should collaborate in the best interest of the industry.

Short term recommendations:
- o When all stakeholders in the pulse industry want to increase consumption amongst all consumers messaging should be focused on the healthiness and environmental friendliness of pulses.
- o When all stakeholders in the pulse industry want to increase consumption amongst people with a low pulse consumption frequency, messaging should specifically focus on the tastiness of pulses and pulses as a cheap source of protein.
- o Pulse businesses could educate their consumers on how to use pulses in a main dish. By, for example, sharing recipes and instruction videos. When consumers feel more confident about being able to prepare pulses, it lowers the barrier to purchase pulses.

Long term recommendations:
- o All stakeholders in the pulse industry should collaborate on educating the whole population on the overall benefits of pulses and the preparation of pulses. This could be done in elementary and high schools as an extra curriculum.
- o Further research amongst a larger and more representative sample is needed in order to verify and extrapolate the results of this research to the general population.
- o Further research in the Netherlands, should take into account the different migration backgrounds of the population. An ethnicity question should be included in the demographic part of the questionnaire.
- o This research is not applicable to other countries as it focusses on the Dutch population. However, the materials and methods could be applied to other populations and similar research could be recreated.

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Appendix I: Questionnaire (English)

Thank you in advance for taking the time to fill out this questionnaire. My name is Peter Dekker a student of the International Food Business Program at the Aeres University of Applied Sciences in Dronten. For my fourth year Bachelor thesis, I am looking at factors which affect pulse consumption in the Netherlands. Under pulses in this research is meant: peas, beans, lentils and chickpeas (Pulse Canada, 2020). This questionnaire is divided into seven parts about: consumption frequency, diets, competence, protruded health benefits, buying behaviour, attitudes and some general information. The study is anonymous and data will not be shared with third parties.

This questionnaire will only take between 3-5 minutes of your valuable time! If you have any questions or concerns, feel free to e-mail me on the following address: peter.dekker@live.nl
Again thank you in advance for filling out this questionnaire.

I hope you enjoy it!

Peter

Consumption
1. How often do you eat pulses at home or outside home?
- a) Never
- b) Less often than once a year
- c) A few times a year
- d) Once per month
- e) 2-3 times per month
- f) At least once a week

Diets
2. Do you follow any of the following diets?
- a) Flexitarian
- b) Vegetarian
- c) Vegan
- d) None of the above

Competence
Please indicate to what extent you agree with the following statements:
3. 'I know how to include pulses in a main dish'
- a. Fully disagree
- b. Disagree
- c. Agree
- d. Fully agree

4. 'I know how to prepare dried pulses'
- a. Fully disagree
- b. Disagree
- c. Agree
- d. Fully agree

Protruded Health Benefits

These are some of the health claims made about pulses by various organisations and consumers.

Please indicate to what extent you agree with the following statements:

5. 'Eating pulses can improve your nutrition'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

6. 'Eating pulses can help you feel full'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

7. 'Eating pulses can lower bad cholesterol'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

8. 'Eating pulses can lower cancer risk'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

9. 'Eating pulses can help control blood sugar'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

10. 'Eating pulses can improve gut health'
    a. Fully disagree
    b. Disagree
    c. Neither agree or disagree
    d. Agree
    e. Fully agree

11. 'Eating pulses can help lose weight'
   a. Fully disagree
   b. Disagree
   c. Neither agree or disagree
   d. Agree
   e. Fully agree

Attitudes
Please indicate to what extent you agree with the following statements:
12. 'Pulses are tasty'
   a. Fully disagree
   b. Disagree
   c. Neither agree or disagree
   d. Agree
   e. Fully agree

13. 'Eating pulses is good for the environment'
   a. Fully disagree
   b. Disagree
   c. Neither agree or disagree
   d. Agree
   e. Fully agree

14. 'Eating pulses causes gas'
   a. Fully disagree
   b. Disagree
   c. Neither agree or disagree
   d. Agree
   e. Fully agree

15. 'Pulses are the 'poor man's meat'
   a. Fully disagree
   b. Disagree
   c. Neither agree or disagree
   d. Agree
   e. Fully agree

Buying Behaviour
16. What types of packaging of pulses do you use? (Multiple answers possible)
   a) Dried pulses
   b) Canned pulses
   c) Pots with pulses
   d) Standing bags with pulses
   e) I do not use pulses
   f) Other, …

17. What types of pulses do you consume? (Multiple answers possible)
  a) Peas
  b) Beans
  c) Lentils
  d) Chickpeas
  e) I do not consume pulses

18. When you buy pulses, what product characteristics would you take into consideration? (Multiple answers possible)
  a. Price
  b. Quality
  c. Nutritional value
  d. Taste
  e. Convenience
  f. Brand
  g. Familiarity
  h. Other, …
  i. I do not buy pulses

19. If you do not consume pulses, what are the reasons for not doing so? If you do consume pulses what are your motivations for doing so?
…….

Demographics
20. What is your gender?
  a) Female
  b) Male
  c) Other
  d) Rather not say

21. What is your age? (enter 0 if you do not want to share your age)
…………………………………

22. What is your highest obtained degree?
  a) Primary school
  b) High school
  c) MBO
  d) HBO or WO bachelor
  e) Master or Phd
  f) Rather not say

23. What is your yearly income?
    a) Less than €10.000
    b) €10.000 to €20.000
    c) €20.000 to €30.000
    d) €30.000 to €40.000
    e) €40.000 to €50.000
    f) €50.000 to €100.000
    g) More than €100.000
    h) Rather not say

Appendix II: Questionnaire (Dutch)

Bij voorbaat dank voor het nemen van de tijd om deze enquête in te vullen. Mijn naam is Peter Dekker, student van het International Food Business Program aan de Aeres Hogeschool in Dronten. Voor mijn vierdejaars bachelor scriptie kijk ik naar factoren die de peulvruchten consumptie in Nederland beïnvloeden.

In dit onderzoek worden onder peulvruchten de volgende verstaan: erwten, bonen, linzen en kikkererwten (Pulse Canada, 2020).

Deze vragenlijst bestaat uit zeven delen over: consumptiefrequentie, diëten, vaardigheid, gezondheidskenmerken, koopgedrag, houding en algemene informatie.

Het onderzoek is anoniem en gegevens worden niet gedeeld met derden.

Deze enquête neemt slechts 3 tot 5 minuten van uw kostbare tijd in beslag! Als u vragen of opmerkingen heeft, kunt u mij mailen op het volgende emailadres: peter.dekker@live.nl Nogmaals bedankt en ik hoop dat u het leuk vind!

Met vriendelijke groet,

Peter

Consumptie
1. Zowel thuis als buitenshuis, hoe vaak eet u peulvruchten?
   a) Nooit
   b) Minder dan één keer per jaar
   c) Een paar keer per jaar
   d) Eén keer per maand
   e) 2-3 keer per maand
   f) Minimaal één keer per week

Diëten
2. Volgt u een van de volgende diëten?
   a) Flexitarier
   b) Vegetariër
   c) Veganist
   d) Geen van de bovenstaande

Vaardigheden
Geef aan in hoeverre u het eens bent met de volgende stellingen:

3. 'Ik weet hoe ik peulvruchten kan verwerken in een maaltijd'
   a) Sterk oneens
   b) Oneens
   c) Eens
   d) Sterk eens

4. 'Ik weet hoe ik gedroogde peulvruchten moet klaarmaken'
   a) Sterk oneens
   b) Oneens
   c) Eens
   d) Sterk eens

Gezondheidskenmerken
De volgende stellingen zijn verschillende gezondheidskenmerken die toegekend zijn aan peulvruchten door consumenten en verschillende organisaties.
Geef aan in hoeverre u het eens bent met deze stellingen:

5. 'Het eten van peulvruchten kan mijn eetpatroon verbeteren'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

6. 'Het eten van peulvruchten geeft mij een vol gevoel'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

7. 'Het eten van peulvruchten kan een te hoge cholesterol waarde verlagen'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

8. 'Het eten van peulvruchten kan de kans op kanker verlagen'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

9. 'Het eten van peulvruchten kan helpen om de bloedsuikerspiegel onder controle te houden'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

10. 'Het eten van peulvruchten kan de darmgezondheid verbeteren'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

11. 'Het eten van peulvruchten kan helpen bij afvallen'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

Houding
Geef aan in hoeverre u het eens bent met de volgende stellingen:

12. 'Peulvruchten zijn lekker'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

13. 'Het eten van peulvruchten is goed voor het milieu'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

14. 'Van het eten van peulvruchten wordt ik winderig'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

15. 'Peulvruchten zijn het vlees van de armen'
   a) Sterk oneens
   b) Oneens
   c) Niet oneens of eens
   d) Eens
   e) Sterk eens

Koopgedrag

16. Wat voor verpakkingen met peulvruchten gebruikt u? (Meerdere antwoorden zijn mogelijk)
    a) Gedroogde peulvruchten
    b) Peulvruchting in blik
    c) Peulvruchting in pot
    d) Peulvruchten in stazak
    e) Ik gebruik geen peulvruchten

17. Welke soorten peulvruchten consumeert u? (Meerdere antwoorden zijn mogelijk)
    a) Bonen
    b) Linzen
    c) Erwten
    d) Kikkererwten
    e) Ik consumeer geen peulvruchten

18. Als u peulvruchten koopt, welke productkenmerken neemt u mee in uw keuze? (Meerdere antwoorden zijn mogelijk)
    a) Prijs
    b) Kwaliteit
    c) Voedingswaarde
    d) Smaak
    e) Gebruiksgemak
    f) Merk
    g) Bekendheid met
    h) Anders, …………
    i) Ik koop geen peulvruchten

19. Als u geen peulvruchten consumeert, wat zijn daarvoor uw redenen? Als u wel peulvruchten consumeert wat is daarvoor uw motivatie?

……….

Algemene informatie

20. Wat is uw geslacht?
    a) Vrouw
    b) Man
    c) Anders
    d) Zeg ik liever niet

21. Wat is uw leeftijd? (als u uw leeftijd niet wilt delen, vul dan 0 in)
………………………………

22. Wat is uw hoogst behaalde diploma?
    a) Basisonderwijs
    b) Middelbare school
    c) MBO
    d) HBO of WO bachelor
    e) Master of Phd
    g) Zeg ik liever niet

23. Wat is uw jaarlijkse inkomen?
    a) Minder dan €10.000
    a) €10.000 tot €20.000
    b) €20.000 tot €30.000
    c) €30.000 tot €40.000
    d) €40.000 tot €50.000
    e) €50.000 tot €100.000
    f) Meer dan €100.000
    g) Zeg ik liever niet

Appendix III: Questionnaire Posting Information

Accompanying message :

For my bachelor thesis I am looking into consumer behaviour regarding pulse consumption amongst the Dutch population. The survey is only available in Dutch. If you are living the Netherlands and can read Dutch, feel free to fill it in and/or share it! The survey can be found via the posted link. Thank you in advance for your time!

Date of post	Media	Page	Shares
01-07-2020	Facebook	Personal	4
06-07-2020	LinkedIn	Personal	1
07-07-2020	Facebook	Personal	10
13-07-2020	LinkedIn	Personal	1
13-07-2020	Facebook	Personal	6
13-07-2020	Facebook	IFB Group	
13-07-2020	Facebook	Vraag & Aanbod Aeres Hogeschool	
17-07-2020	Facebook	Personal	7
22-07-2020	LinkedIn	Personal	1
22-07-2020	Facebook	Personal	4
22-07-2020	Facebook	Vraag & Aanbod Aeres Hogeschool	

Appendix IV: Cross-Tables of Health Benefits and Pulse Consumption

Table 17 Cross-table of 'Eating pulses can improve your nutrition'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	1	0	0	0	1	2
	%	5,0%	0,0%	0,0%	0,0%	1,2%	0,6%
Disagree	Count	9	3	2	4	2	20
	%	45,0%	6,7%	3,4%	3,6%	2,4%	6,2%
Neither agree or disagree	Count	9	22	22	41	24	118
	%	45,0%	48,9%	37,3%	36,6%	28,2%	36,8%
Agree	Count	1	19	35	57	43	155
	%	5,0%	42,2%	59,3%	50,9%	50,6%	48,3%
Fully agree	Count	0	1	0	10	15	26
	%	0,0%	2,2%	0,0%	8,9%	17,6%	8,1%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 18 Cross-table of 'Eating pulses can help you feel full'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	0	0	0	1	1	2
	%	0,0%	0,0%	0,0%	0,9%	1,2%	0,6%
Disagree	Count	6	2	1	7	3	19
	%	30,0%	4,4%	1,7%	6,3%	3,5%	5,9%
Neither agree or disagree	Count	7	17	22	31	14	91
	%	35,0%	37,8%	37,3%	27,7%	16,5%	28,3%
Agree	Count	6	25	33	61	53	178
	%	30,0%	55,6%	55,9%	54,5%	62,4%	55,5%
Fully agree	Count	1	1	3	12	14	31
	%	5,0%	2,2%	5,1%	10,7%	16,5%	9,7%
Total	Count	20	20	45	59	112	85
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 19 Cross-table of 'Eating pulses can lower bad cholesterol'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	2	0	0	0	0	2
	%	10,0%	0,0%	0,0%	0,0%	0,0%	0,6%
Disagree	Count	4	3	3	5	5	20
	%	20,0%	6,7%	5,1%	4,5%	5,9%	6,2%
Neither agree or disagree	Count	13	37	43	79	57	229
	%	65,0%	82,2%	72,9%	70,5%	67,1%	71,3%
Agree	Count	1	5	13	27	19	65
	%	5,0%	11,1%	22,0%	24,1%	22,4%	20,2%
Fully agree	Count	0	0	0	1	4	5
	%	0,0%	0,0%	0,0%	0,9%	4,7%	1,6%
Total	Count	20	20	45	59	112	85
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 20 Cross-table of 'Eating pulses can lower cancer risk'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	5	1	0	6	1	13
	%	25,0%	2,2%	0,0%	5,4%	1,2%	4,0%
Disagree	Count	5	4	5	11	12	37
	%	25,0%	8,9%	8,5%	9,8%	14,1%	11,5%
Neither agree or disagree	Count	8	38	50	81	52	229
	%	40,0%	84,4%	84,7%	72,3%	61,2%	71,3%
Agree	Count	2	2	4	13	17	38
	%	10,0%	4,4%	6,8%	11,6%	20,0%	11,8%
Fully agree	Count	0	0	0	1	3	4
	%	0,0%	0,0%	0,0%	0,9%	3,5%	1,2%
Total	Count	20	20	45	59	112	85
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 21 Cross-table of 'Eating pulses can help control blood sugar'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Fully disagree	Count	2	0	0	0	0	2
	%	10,0%	0,0%	0,0%	0,0%	0,0%	0,6%
Disagree	Count	2	3	1	7	3	16
	%	10,0%	6,7%	1,7%	6,3%	3,5%	5,0%
Neither agree or disagree	Count	13	34	41	64	51	203
	%	65,0%	75,6%	69,5%	57,1%	60,0%	63,2%
Agree	Count	2	8	17	40	28	95
	%	10,0%	17,8%	28,8%	35,7%	32,9%	29,6%
Fully agree	Count	1	0	0	1	3	5
	%	5,0%	0,0%	0,0%	0,9%	3,5%	1,6%
Total	Count	20	20	45	59	112	85
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 22 Cross-table of 'Eating pulses can improve gut health'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	Total
Disagree	Count	7	2	0	3	1	13
	%	35,0%	4,4%	0,0%	2,7%	1,2%	4,0%
Neither agree or disagree	Count	8	17	29	37	29	120
	%	40,0%	37,8%	49,2%	33,0%	34,1%	37,4%
Agree	Count	5	20	29	63	47	164
	%	25,0%	44,4%	49,2%	56,3%	55,3%	51,1%
Fully agree	Count	0	6	1	9	8	24
	%	0,0%	13,3%	1,7%	8,0%	9,4%	7,5%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 23 Cross-table of 'Eating pulses can help lose weight'

		Less often than once a year	A few times a year	Once per month	2-3 times per month	At least once a week	
Disagree	Count	9	5	2	5	3	24
	%	45,0%	11,1%	3,4%	4,5%	3,5%	7,5%
Neither agree or disagree	Count	7	28	36	52	44	167
	%	35,0%	62,2%	61,0%	46,4%	51,8%	52,0%
Agree	Count	4	11	20	52	34	121
	%	20,0%	24,4%	33,9%	46,4%	40,0%	37,7%
Fully agree	Count	0	1	1	3	4	9
	%	0,0%	2,2%	1,7%	2,7%	4,7%	2,8%
Total	Count	20	45	59	112	85	321
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%