# Would you unconsciously go green?

A research about which factors influence the buying behaviour of the consumer towards carbon labelled food products.

Bachelor thesis of Computer Science & Economics Leiden University



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## Abstract

This research aims to define which factors influence the buying behaviour of the customer towards food products when they are labelled with carbon labels and are differentiated with a higher price. Studies already have shown that greenhouse gas emission reductions can be obtained through food production. [2] And that green labels have a positive influence on the buying behaviour of the consumer. [5] The data of this research is collected through a survey and will be analysed by chi-square tests and multinomial logistic regression. Results from existing literature will be verified and own findings will be discussed. In total 3/3 of the participants chose for a more sustainable label. Which implies that the majority of consumers are inclined towards coloured sustainable labels and are willing to pay more for a sustainable food product. The characteristics that influenced this behaviour the most are the consumers' income, age, eco consciousness and educational level. The impact of this research to society is that companies can adjust their marketing strategies to target specific customers. Accurate predictions on the product choice can be made with characteristics of consumers that are known or need to be collected by companies. Besides that, this research supports that companies can reduce their generated emissions by sustainable food production and that they can incorporate the costs of sustainable production in the product price.

## Introduction

Climate change is not a recently discovered subject, but we do see that people are becoming more and more aware of the impact and that it influences their consumption choices. For food products multiple labels exist to get the consumers' attention and to help them make the desired choices. For example the thumbs up label, which indicates that the product is a good price deal. And another label for when the product is on sale. Yet another one is the green 'bio' label which indicates that the product is biologically produced. On ah.nl there is even a label that shows that the product is made in the Netherlands. See figure 1 for the labels. The label that is most informative, is the nutrition label. This label is used on processed and unprocessed food products. It comes with a scale from A to E, where A has a green colour for a product with the healthiest composition. And E is red and for the unhealthiest composition. The nutri-score aims at helping consumers make information. Not one of them includes some information on sustainability or carbon emissions. This is different in the clothing industry where they already add green, sustainable tags onto clothing to show that the product has been produced sustainable.

As stated before carbon or sustainability labels are not being used yet on food products . Whereas "End-consumption-focussed, environmental input–output studies confirm that groceries are implicated in a large proportion (about one third) of the total environmental impact and emissions arising from EU economies." There is a potential carbon emission saving of 10% per person per year when labels are used in a certain number of consumption choices and the label is widely applied as a carbon reduction sign.[2] This emphasises the importance of sustainable food production and shows how much improvement can be achieved by using sustainable labels. Therefore this research will focus on the labelling of food products.

The purpose of this paper is to determine what characteristics influence the consumers buying behaviour the most. And to find out how much more customers are willing to pay for food products that are provided with a carbon footprint label. This outcome will be useful for organisations who want to reduce their generated emissions and at the same time maintain their profit margins. The information will help them decide whether the extra costs, for example, a more sustainable production can be incorporated in the price of the product whilst maintaining their market share. In addition marketing can be improved to target specific customers. Which boils down to the research question:

Which factors influence the buying behaviour of the customer towards food products when they are labelled with carbon labels and are differentiated with a higher price?



Figure 1: two food products with multiple labels (from ah.nl)

# Theoretical background

The theoretical background consists of results on different relevant topics and a summary of the existing work. All the findings from previous research are summarised in table 1. In the discussion section have these results been tested and substantiated with the results from this research. The numbers in the table refer to the corresponding elaboration. Furthermore, many decisions made for the survey are based on findings of previous research. Further explanation on those topics can be found in the experimental design.

### 2.1 Definition of terms

**Environmental consciousness:** Also mentioned as eco consciousness. "Showing a strong sense of environmental responsibility (i.e., supporting efforts to protect and preserve the environment as well as advising others to behave accordingly)" [3]

**Green consumerism:** "A pro-environmental consumer culture, which is characterised by a strong sense of environmental responsibility in consumption behaviour" [3] **Sustainable labels:** The carbon footprint labels that indicate a reduction of the greenhouse gas/carbon emissions. Within this research the sustainable labels are used on the food products in the colours red, yellow and green.

**Greenhouse gas emission:** Also GHG. "Gases which emission increase are responsible for global warming and climate change."[31]

### 2.2 Relevant topics

Some researches are based on their own tests and some are based on former published results. The research groups also differ per research, some have a mixed focus group and some are more specific. Most research on the influence of labels focus on one product, such as coffee, milk or electric vehicles. This research takes seven food products into account. There are already many studies on the effectiveness of different variations of labels. It has been proven that relative information on labels in combination with traffic light colours have a significant influence on the performance of the label.[4] The traffic light colours are effective because consumers are more inclined to green labels. This is because there is an intrinsic motivation in people which moves the attention towards the green colour of the label. This effect has the biggest impact on highly environmentally conscious consumers. Even when the product provided contradicting information, they still had a preference for the green labeled product. [5]

Factors which influence green consumption behaviour are for example the environmental consciousness and trust in the label.[6] In addition, socio economic factors such as age, income and gender are frequently seen as significant factors in the buying behaviour.[7] Although consumers are inclined towards green labelled products, it is not always proven that they are willing to pay more for sustainable products.[8] Research has suggested that consumers might be willing to pay a premium for not buying the worst product, what is called 'negative labelling'.[9] Besides that, there are also researches with contradicting results, where the consumers were not always willing to use the label in their product choice.[2] A research that focussed on the influence of carbon footprint labels addresses that there is a need for a recognizable system so that consumers can easily interpret the labels. It suggested testing the willingness to pay for the carbon labels as future work.[9]

### 2.3 Literature review

Reference	Research group	Method	Results
[1] Consumers behaviour towards carbon footprint labels on food: A review of the literature and discussion of industry implications - ScienceDirect [9]	Consumers in multiple emerging countries.	Summarising 38 published and peer reviewed articles about consumer behaviour towards carbon labelled food products.	<ul> <li>(1.1) Consumers are more inclined towards green labelled products.</li> <li>(1.2) Groups with higher environmental concern are willing to pay more for labelled food products.</li> <li>(1.3) Consumers lack information about carbon measurements and there is a shortage in comprehension of the existing carbon labels.</li> </ul>
[2] <u>Green Marketing</u> and the Concern over the Environment: <u>Measuring</u> <u>Environmental</u> <u>Consciousness of</u> <u>Jordanian Consumers</u> [3]	Jordanian university consumers.	Questionnaire among Jordanian university students.	<ul> <li>(2.1) There is no significant difference in consumers' environmental consciousness due to gender</li> <li>(2.2) There is no significant difference in consumers' environmental consciousness due to income</li> <li>(2.3) Jordanian consumers do not adopt green consumerism because they are eco conscious.</li> </ul>
			(2.4) There is no significant difference in consumers' likelihood of adopting

			green consumerism due to income
			(2.5) There is no significant difference in consumers' likelihood to adopt green consumerism due to gender
[3]Green marketing consumer-level theory review: A compendium ofMultiple groups from the literature.Review of 20 theories about green marketing. The theories are grouped into six categories	(3.1) Not a lot of customers are willing to pay more for green products		
further research directions - ScienceDirect [7]		into oix outegoneo.	(3.2) There is a gap between green consumer intentions and behaviour
[4] <u>Eco Labels and</u> <u>Eco Conscious</u> <u>Consumer Behavior:</u> <u>The Mediating Effect</u> <u>of Green Trust and</u> <u>Environmental</u> <u>Concern</u> [10]	Citizens of a city in Pakistan.	Empirical study of in depth interviews.	Consumers' understanding of eco labels will positively influence consumers' eco conscious buying behaviour mediated by consumers' trust on green claims.
			Positive influence of eco labels on eco conscious behaviour.
Sustainable consumption: green consumer behaviour when purchasing	81 green consumers in the UK.	Green consumer behaviour in the buying process, done through in depth	Green motivation and knowledge influence the consumer
products [11]		interviews. On technology products.	Price incentives and labels could help the consumer
			(4.1) Whether the consumer can afford the products is a key factor that will help into a greener purchase behaviour
Sustainability   Free Full-Text   The ABC's of Ecological and Nutrition Labels. The	Young adults.	Online experiment in a grocery shop setting.	First experiment: The labels indicated the summarised product score as a nutrition or

Impact of Label Theme and Complexity on the Environmental Footprint of Online Grocery Choices[12]		<ol> <li>Experiment with product labels and a total product (nutrition/environment al) score.</li> <li>Experiment with a varied level of complexity label.</li> </ol>	ecological score of that product. There was no label impact found in this experiment. (5.1) Ecological labels would lead to more sustainable food choices, compared to products which are not labelled (especially young adults).
What determines consumers' use of eco-labels? Taking a close look at label trust - ScienceDirect [5]	European consumers.	Analysis of a large dataset: testing the trust in and use of the labels among European consumers.	(6.1) If the consumer has trust in the eco label, they are more likely to use the label in their purchase decision.
Carbon labelling influences on consumers' behaviour: A system dynamics approach -	Consumers from different target groups.	Empirical study based on a survey. Research on carbon labelled milk.	(7.1) Purchase intentions could be influenced by consumers' eco consciousness.
ScienceDirect [13]			(7.2) Environmental awareness and educational level are factors that influence the labelled milk purchasing. The factors Income and attitude towards risk can be neglected.
<u>A better carbon</u> <u>footprint label -</u> <u>ScienceDirect</u> [8]	Danish consumers.	Discrete choice experiment among Danish consumers. Product: ground coffee.	(8.1) Carbon footprint labels have a positive influence on the consumers' product choice when they know the meaning of the label and when they are eco conscious.
			(8.2) The more environmentally concerned the customer is, the bigger the impact of the carbon label.

In their own words: A qualitative study exploring influences on the food choices of university students - Lambert - 2019 - Health Promotion Journal of Australia	Australian university students.	Qualitative research done through interviews.	<ul><li>(9.1) Living without your parents as a student influences your choices.</li><li>(9.2) Cooking skills and confidence often influences the</li></ul>
[14]			choices.

Table 1: summary of existing work

## Methodology

The aim of this research is to observe the buying behaviour of consumers when food products are labelled with carbon emission labels and are differentiated in price. In addition it is explored what factors and characteristics of the consumer influence the exact behaviour. The data is collected through a survey in Qualtrics, from there the data is exported in a CSV file. In R-studio data was processed and multiple tests were conducted.

To achieve the goal of this research, three types of tests were executed. The chi square test to test the association between two variables. Once the Spearman's correlation was used to test whether there was a positive or negative association between ordered variables. The third test is a multinomial logistic regression (also: MLR), since there are more than two categorical outcome variables. MLR will calculate a probability of a multi variable outcome as a function of one or multiple independent variables. From this test it can be observed which variables make the best predictions on the outcome variable and whether the collected variables influence the consumers choice of label colour. This research will focus on the dataset as a whole and the four different versions of the survey separately.

### 3.1 Data collection

The data is collected through a survey made for the purpose of this research. To clean the data, a few incomplete submissions were deleted. The survey was spread through the personal network and social media, there was no specific target group.

The response data was exported as a numeric CSV format. The imported data was checked and some variables were changed due to wrong numeric values that were assigned to the response data. The test could be conducted after the data was cleaned and corrected. The dataset distinguishes two types of variables; one dependent variable and 12 independent variables. The dependent variable is the colour of the label on the food product. Existing of (1) Red labelled, (2) Yellow labelled and (3) Green labelled. The independent variables are divided into four categories; demographic information, random information, eco-consciousness, green consumerism and personality traits of participants. Most of the independent variables are categorical variables. Age, income, frequency of weekly grocery shopping, hours of sleep and daily time spent on phone are numeric, but were made categorical for the chi-square test. The variables preference online purchasing, preference for cooking meals, eco consciousness, green consumerism and personality traits are 7-point Likert scale variables where 1 = Disagree strongly and 7 = Agree strongly. These fall under ordinal data since the differences between the items are not specified. Appendix 1 contains a list with variables per category, the corresponding answers per question from the survey are added.

*Demographic information* (10 variables): Most of these independent variables are categorical. For the chi-square test were 'Age' and 'Income' divided into blocks so that they could be placed into categories. The food products in the survey are not gender specific, so the variable 'gender' is disregarded in most of the research. In addition to that, the variable 'working industry' was very distributed, as it had no added value to the research and therefore it was not taken into consideration either.

*Random variables* (5 variables): frequency of weekly grocery shopping, hours of sleep and daily time spent on phone are or the chi-square test they considered as categorical values and for the MLR as numeric.

*Environmental consciousness* (1 variable): The answers of these questions were rated based on the 7 point Likert scale, from (1) Disagree Strongly to (7) Agree strongly. This is categorical data. To give an overall rating of the participants' environmental consciousness, the rounded average of the four questions was taken in MLR. The spearman's correlation test has been conducted once the ordening was relevant. Once the ordening was not relevant, the numbers were categorised into three scales for the chi-square test. Disagree (score 1-3); Neutral (score 4); Agree (score 4-7). This is the same scale used in the research from which the questions are derived from. [16]

*Green consumerism* (1 variable): The variable 'green consumerism' is processed in the same way as environmental consciousness.

*Personality traits* (5 variables): There are five traits distinguished: extraversion, agreeableness, conscientiousness, emotionally stable and openness to experience. Two questions are assigned per personality trait. The average of these two questions determines how much the personality trait applies to the participants. To make the categorisation of the personality traits less specific, the scoring is divided into three categories; Does not apply (score 1-3); Neutral (score 4); Does apply (score 4-7).

### 3.2 Experimental design

### 3.2.1 Survey

The survey is made through qualtrics and is spread through personal networks and social media, no personal data from the participants is stored. The survey consists of five parts: demographic information, random questions, product selection, environmental consciousness, green consumerism and personality traits. No information about the goal of the research was provided to the participants in the survey. In this way they could not feel the need to behave or answer the questions according to social norms and values. Because the labels were unknown to the participant, some information about the meaning of the label was added in the survey to prevent misunderstanding. Before the questions about product selection started there was an example picture of the labels, with explanation about the meaning of them and how the emission reduction was achieved through the production process.

This chapter contains the idea behind the questions in the survey. Each of the five parts is explained and substantiated. The survey questions and corresponding answers are included in the appendix.

### Demographic information

Ten questions were selected to gather demographic information about the participant. The questions were based on collected data from Centraal Bureau voor Statistiek (<u>https://www.cbs.nl/</u>) and Eurostat European Statistics (<u>https://ec.europa.eu/eurostat/</u>). The goal was to collect some information about the participant, such as their socio-economic status. With this data it was possible to compare the focus groups in the different versions of the survey and to test which factors influence the participants' consumption behaviour.

### Random questions

The random questions were added to possibly find new factors which influence the participants' consumption behaviour. Two questions were based on research which found out that cooking skills in combination with time and effort for preparing food influence the food consumption choices. Besides that social media has an impact on body ideals which influences food choices [14]. To test these factors the participant was asked to rate how much they prefer cooking their own food and the second question asked about their daily time spent on their phone. Since the COVID pandemic online shopping continues to grow in the EU. In 2016 63% of the internet users bought or ordered goods or services for private use in the previous 12 months, compared to 74% in 2021.[15] A question about preference for online purchasing was added to the survey considering the importance of online shopping. In total there are five random questions in the survey.

### Product selection

### The design of the label

Within eco-labels multiple variations of labels are being used. The labels can be provided with a star ranking, with a calculated co2 number, a percentage or with a short text (ex. 'carbon neutral/low-co2 product'). Consumers have different preferences with regard to the type of footprint label, therefore it remains debatable which label is most effective. However the majority has a preference for a footprint label which enables a comparison among different products.[16]

One example of a comparison label is a research which will take place in the fall of 2022. A label with a scale from A to G is used to indicate the ecological impact, where label A has the least negative ecological impact and is given a green colour and label G has the most ecological impact and is given a red colour.[17] These coloured scale labels look similar to the Nutri-Score labels which are already used on products to support consumers by making healthier food consumption choices. Different stakeholders argue for making the Nutri-Score label obligatory in Europe[18]. This creates a realistic chance that the Nutri-Label will be used for most food products across Europe. It will be confusing for customers to have two similar labels for the Nutri-Score and the ecological impact. Therefore a different comparison scale is used, namely a percentage label. More information about this percentage is discussed in the subsection below 'The percentage on the label'.

Research has shown that eco-labels help the consumer with their environmentally conscious behaviour. The same implies for green trust as it positively influences the environmentally conscious behaviour of the customer.[10] A third party certification could help to increase the trust in green labels.[5] To gain the green trust of the participant in this research, the questions include an explanation of the provided label in which it says that the label is certified by a third party. In addition to that, the label is based on the shape of the Carbon Trust footprint label which is a certified carbon label. This independent organisation calculates the total greenhouse gas emission which is caused by the complete production process of one product. They offer multiple labels which provide different kinds of information about the products' carbon impact.[19] The Carbon Trust does not use traffic light colours for their certified labels. Although it is proven that using traffic light colours (green-yellow-red) for carbon labels has a significant effect on the effectiveness of the label, especially once the relative performance is communicated. Other research compared the original Carbon Trust

label with labels where the traffic light colour was added. It has shown that traffic light coloured labels would be useful to provide on products in addition to the existing labels.[8] The label used in this survey is a self-designed label because the Carbon Trust does not provide multiple coloured labels. As the findings of the research described above concluded that the consumer has a preference for comparable labels. Therefore this research used self-designed labels in the shape of a footprint, with traffic light colours and percentages so that participants were able to compare the products.

### Placement of the label

The placement of the label in the product picture is based on research which compared the customers' purchase intentions when a carbon label was placed on the right versus on the left of the product. They advised on the visual location of the carbon label on the product. The purchase intentions of customers can be increased by placing the label on the horizontal location and on the right of the visual field. Also it can increase their perception of the environmental importance of that specific product.[20]

### The percentage on the label

To calculate per product the possible carbon emission reduction is quite difficult since a lot of factors need to be taken into account. It would lead to increased greenhouse gas emissions to convert conventional product production to biological production as a result of, for example, lower quantity production and therefore the need for more (oversea) land space.[21]

To reduce the greenhouse gas emission through food production, there is a need for various changes in the whole production chain. This results in a differentiated procedure which, for example includes, localisation of the food production which reduces oversea transportation. Moreover in other parts of the food production chain, minimising refrigeration and food waste. In every component of the food system the potential GHG saving is calculated, which takes into account that there is a 10% achievable reduction within 15 years. This comes down to a total GHG saving of 14-54%.[21]

The minimum GHG saving (14%) is used for the red label, thus the maximum is used for the green label (54%). The average reduction is calculated for the yellow label, which results in 34%. By adding these percentages to the labels, the participant is given some information about the product emission reduction without the need for a lot of extra explanation.

### The food products

The customer's attitude towards quality, value and brand preference is directly influenced by visual food packaging.[23] Since the participant solely needs to be influenced by the products' eco-label and price, there are no brands or remarkable packaging used for the products in the survey. The below picture shows two survey examples using neutral and unbranded packaging.

The products provided in the survey are based on the most sold products of CBL [24] and the five categories of the dietary guidelines. The dietary guidelines of various countries distinguish five food categories: fruits/vegetables, grains, drinks, protein and fats.[25] Out of each of these categories one product that belongs to the statistics of most sold products of CBL is chosen. This research also includes unhealthy food. In total seven products are included in the survey.

Fruits/vegetables: Bananas Grains: Bread

Drinks:	Теа
Protein:	Eggs
Fats:	Olive oil
Extra products:	Crisps and beer

### Price of the product

Each question shows one product with three different prices and eco-labels. The price of the red-labelled product is based on the price of the cheapest product option on ah.nl, this price is considered the base price. The price increase is calculated from the base price, for example the yellow labelled product is 10% more expensive than the red labelled product, and the green-labelled product is 10% more expensive compared to the yellow label. There are four different survey versions with price increases: 5%, 10%, 20% and 20% + sustainable work environment. Each participant is presented with one version and all versions are equally spread across the total number of participants.

### The final label

Based on all previous findings the decision is made to use a red, yellow and green footprint label each containing a percentage of the greenhouse gas emission reduction. The colour green is used for products with a low carbon emission, whereas red is used to indicate products with a relatively high carbon footprint.

The label was placed on the right of the product and a short explanation about the label was added. These decisions ensure that the labels are comparable and should have significant influence on the customers' behaviour.

Each product has three options: the first option is the product with a red label and the cheapest price; the second option is the product with a yellow label and for example a 10% price increase; the third option has a green label and again a 10% price increase.



Figure 1: an example of a question for the product selection (Eggs, 5% price increase)

### Environmental consciousness and green consumerism

Eight questions in the survey are added to rate the two dimensions environmental consciousness and green consumerism. The questions are based on a questionnaire from a research, this questionnaire contains ten questions per dimension.[3] For this research four questions per dimension were selected, because there was limited time and these are only a small aspect of the total research.

### The personality traits

The survey consists of several questions to determine the personality traits of the participants. To determine this, a shorter version of the Big Five Inventory is used (also: BFI). From these questions five personality domains are distinguished: extraversion, agreeableness, conscientiousness, neuroticism and openness.

Papers encourage researchers to use the BFI as a measurement since there is evidence that the BFI is reliable.[26] In addition, it is tested among multiple cultures, countries and areas from which it can be seen that the questions can be used cross-cultural. Thus the BFI remains consistent between different ages [27] and genders [28] and it matches with actual predictions in behaviour.[29] The BFI originally consists of a questionnaire with 44 items which takes guite some time for participants to fill in. Since there was a common need for shorter versions, different versions were made. Two short versions were considered, the Five item Personality Inventory (FIPI) and the ten-item inventory (TIPI). The advantage of shorter versions is that the complexity and the time taken to complete the test are reduced. The disadvantage is that there are limitations, the shorter versions are less reliable and have weaker correlations compared to the BFI. The FIPI and TIPI are also tested on wide use and reliability. Although these are less accurate compared to the standard BFI they are reasonable alternatives for the BFI. Of the two questionnaires, the foundations of the TIPI are known and reasonable, so this one is recommended in the research.[30] Within this survey a shorter version is used since there is limited time in the survey and determining personality traits is not the main focus of this research. The TIPI will only take a minute to complete, so this one is the best option to determine personality traits of the participants in this research. In the survey the participant indicates whether the ten questions apply to him/her, based on the 7 point Likert scale, where (1) Disagree strongly and (7) Agree strongly. Two questions are assigned per personality trait. The ten item personality inventory comes with a scale rating, where the (R) denotes a reverse scoring.

## Results

### 4.1 Overview of the complete dataset

### 4.1.1 Summary of the variables

Table 1 shows a summary of the variables in the different versions of the survey and for the survey as a whole. The numeric variables are summarised by showing the mean and the standard deviation. For the categorical data the percentages of the two largest represented groups are shown. The variables in every group are quite evenly distributed. One thing to notice is that the '10% price increase' group contains relatively more students. This can be determined by the high percentage of the variables; high school as the groups' highest level of education, students at employment status and the multi person household.

	<b>5% inc</b> (n = 26)	rease )	<b>10% in</b> (n = 24	crease )	<b>20% in</b> (n = 26	20% increase (n = 26)20% increase + social sustainability (n = 24)To (n = 24)		20% increase + social sustainability (n = 24)		))		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Age	35	15,9	34	16,7	34	18,6	37	17,4	35	17		
Income	3350	2909,1	8770	20769	6407	19293,5	7339	20375,7	6404	17229		
Education	46% bac 27% mas	helor ster	46% Hig 38% Bac	h School helor	42% bac 31% higl	helor h school	46% bac 25% mas	helor ster	43% Bac 28% High	helor n School		
Employment	42% Full 35% Stu	Full Time54% student42%Student25% full time27%		54% student 25% full time		42% student 27% full time		38% part time 38% student		38% part time 38% student		ent me
	35% rent market p	t at rice	* 38% rent market p	t at rice	42% ren market p	t at rice	42% rent at market price 33% owner-occupied r with mortgage or housing loan		39% rent at market price			
Housing status	35% owner-oo with mor housing	ccupied tgage or loan	29% owner-oo with mor housing	ccupied tgage or loan	35% owner-oo with mor housing	ccupied tgage or loan			33% owner-oc mortgage housing l	cupied or oan		
Living area	62% city 38% tow	n/suburb	* 58% city 25% tow	n/suburb	** 69% city 23% town/suburb		* 67% city 25% town/suburb		64% city 28% towr	n/suburb		
Household	38% mul 27% cou children	tiperson ple w/o	54% mul 17% cou children	tiperson ple with	46% mul 27% cou without c	ti person ple hildren	29% couple w/o children 25% multi person		41% mult 24% coup children	i person ble w/o		
Eco Consciousn ess	4,3	1,2	3,8*	1,2*	4,1	1,4	4	1,1	4,1	1,2		
Green consumptio n	4,9	1	4,7	1,2	5	1,1	4,8	1,1	4,9	1,1		

\* not significant in chi-square test p > 0,05 \*\* not significant in chi-square test p > 0,01

Table 1: overview summary of the variables

### 4.1.2 Choices per label



Figure 3: product choice per price increase (in percentage)

The figure shows the total of choices for every label in the complete dataset, there is a total overview and a column for each survey version separately. The colours indicate the colours of the labels on the food products (red-yellow-green). The different versions of the survey all include seven products with for each product three options; a red label, yellow label and a green label. In total 700 products were chosen, with 100 participants and 7 products. In the most left column the 5% product price increase version is shown. In 44% of the 182 cases the consumers selected the green labelled product and in 27% of the cases the red labelled product as their choice. In the survey version of the '20% increase', the '20% + social sustainability' and 'total' the figure shows that each colour label is distributed around the 33%. The red label is seen as the basis dependent variable. At least  $\frac{2}{3}$  of the participants chose the yellow or green labelled product above the red labelled product. The '10% increase' version has a different outcome than the other versions. The participants choose the red labelled product in 45% of the cases, compared to 30% of the green labelled products. This is almost the opposite of the '5% price increase' outcome. Table 1 can be used to examine what caused the difference in results of the label choice for the '10% price increase' version compared to the other versions.

### 4.1.3 Choices per product

The survey includes seven types of products, each from another category of the 'schijf van vijf' and each from another price level. The following table shows the count per product per label.

	Red	Yellow	Green
Egg	29%	36%	35%
Crisps	32%	33%	35%
Banana	24%	35%	41%
Теа	31%	32%	37%
Olive Oil	45%	25%	30%
Bread	24%	29%	47%
Beer	50%	32%	18%

Table 2: percentage of choices per product per colour label

The highest percentage of the product is in bold. The most bold percentages are in the green label column. One is in the yellow label and two are in the red labelled column. For the products olive oil and beer the red labelled product is chosen the most. Which implies that consumers are more inclined towards red labels for the products olive oil and beer. Compared to the other products, which mainly have the highest count in the green label. Olive oil and Beer are more expensive products than, for example, bread and bananas. Which results in a greater percentage price increase for a more sustainable label.

### 4.1.4 Chi-square test

In the chi-square test every variable was tested on the colour label of the product (red/yellow/green). With H0; the variables are independent and H1; the variables are dependent. H0 is rejected once the calculated p-value is below the significance value of 0,05. The results show that the colour of the products' label is dependent on most of the variables.

In the complete data set the variables from the personality traits; extraversion, agreeableness and emotionally stable are not significantly associated with the colour of the label, thus independent. The other independent variables all have a p-value < 0,05. In the '5% price increase' version all the variables are significantly associated with the colour of the label.

In the '10% price increase' version only the variables housing status, living area and eco consciousness are not significantly associated with the colour label. The others all have a p-value < 0,05.

In the '20% price increase' version all the variables are significantly associated with the colour of the label.

In the '20% price increase + social sustainability' version only the variable living area is not significantly associated with the colour label. The others all have a p-value < 0,05.

In the next section some results of the chi-square tests will be discussed in more detail.

### 4.2 Data analytics

### 4.2.1 Verifying literature review

Some results are extracted from previous work, which are specified in the table and in section 2.3. The numbers in front of the repeated results refer to the table summarising the existing work in section 2.3. This research will verify these results mostly using the chi-square test. A significance level of p<0,05 and p<0,01 is used. There is an association between the independent variable and the outcome variable if the p-value is lower than the significance level. As stated in section 3.2, the dependent variable is the colour of the label on the food product. Existing of (1) Red labelled, (2) Yellow labelled and (3) Green labelled. The independent variables are listed in appendix 1.

Further data from the chi-square test is in tables and figures, 1 verifying literature review.

### (1.1) Consumers are more inclined towards green labelled products.

This is partly accepted. Looking at the barchart in figure 3, this hypothesis is accepted for the '5% price increase' version in which 44% of the consumers chose the green labelled product instead of the red and yellow label. The participants chose the green label in at least 30% of the cases in every survey version. For the complete dataset in figure 3 we see that 34% of the total product choices were in favour of green labelled products. In total, out of the 700 options, the participants chose the red label 236 times, the yellow label 222 times and the green label 242 times. The green label is the most chosen option, but the count does not differ much from the other labels.

It can be concluded that the participants are influenced by the coloured labels and willing to pay more for a more sustainable label. Since they also had an option for the yellow labelled product we can not conclude that consumers are solely inclined towards the green labelled product, but the research does show that the consumers are inclined towards a more sustainable label (yellow or green).

# (1.2) Groups with higher environmental concern are willing to pay more for labelled food products.

Accepted. The red label is the cheapest option in this research. Higher environmentally concerned participants are willing to pay more for labelled products once they choose the yellow or green labelled product, since these are differentiated with a higher price. The p-value = 2.348e-16 which indicates a significant association between the two variables. In the contingency table (tables and figures, 1) can be seen that the highly environmentally conscious participants choose the green labelled product the most. The participants who scored lower (disagree and neutral, score 1-4) had the highest count on the red labelled product. From the chi-square test it is concluded that eco consciousness has a significant influence on the product choice, and thus on the willingness to pay for a labelled product. Highly environmentally conscious participants who scored 5 or higher are more inclined towards the more expensive green labelled product.

(1.3) Consumers lack information about carbon measurements and there is a shortage in comprehension of the existing carbon labels.

The amount of understanding and lack of information about carbon labelling is not tested in this research. This result has been used to prevent misunderstanding. Some information about the meaning of the label was added to the question in the survey.

# (2.1) There is no significant difference in consumers' environmental consciousness due to gender.

Accepted. The chi-square test is done on the variable gender and environmental consciousness. This results in a p-value of 0,4064, which is higher than 0,05. Therefore there is no significant influence on consumers' environmental consciousness due to gender. (Tables and figures, 2)

# (2.2) There is no significant difference in consumers' environmental consciousness due to income.

Accepted. There is a p-value of 0,2308 when the chi-square test is performed on the variables environmental consciousness and income. The p-value is higher than the significance level, thus there is no significant association in consumers' environmental consciousness due to income.(Tables and figures, 3)

# (2.3) Jordanian consumers are not likely to adopt green consumerism because they are eco conscious.

Not accepted. From the results of the chi-square test it can be concluded that eco consciousness has a significant influence on green consumerism. (Tables and figures, 4) When the participants score high on the environmental consciousness questions, they are more likely to adopt green consumerism. P-value of 5.469e-06 which is lower than the significance level. This is not consistent with the results from the mentioned research.

When the spearman's correlation test is executed the p-value = 2.618e-11, which is also significant. The rho is 0.605, which means that if the eco consciousness increases the green consumerism also increases. Which implies that consumers are likely to adopt green consumerism when they are eco conscious.

# (2.4) There is no significant difference in consumers' likelihood of adopting green consumerism due to income.

Partly accepted. The chi-squared test on the actual consumer behaviour gave a p-value of 2.49e-11 (< 0,01). This was run on the variables income and colour of the label. Looking at the contingency table, 29% of the lower income group (0-5k) chose green labelled products in comparison to 56% in the higher incomes 5k-100k. The income group of 15k-20k had the lowest green labelled products count, only 7%, this group is an exception of the green consumer behaviour.

Although, when the chi square test is run on the theoretical green consumerism, namely the variable income group and the variable green behaviour. It results in no significant association (p-value = 0.4083 > 0.05). Which shows there is no significant difference, thus the two variables are independent.

There is a difference between in practice green behaviour and theoretical. We reject H0 for the actual green consumerism. We accept H0 for the theoretical green consumerism.

# (2.5) There is no significant difference in consumers' likelihood to adopt green consumerism due to gender.

Not accepted in this research. The p-value of the chi-squared test is 0.0001263 which is lower than 0,05 and 0,01, which implies a significant association between

gender and label choice. 43% of the male participants in this research chose the green labelled products. Whereas, 27% of the women chose green labelled products. The male consumers are more inclined towards green labelled products. Which does not support the mentioned hypothesis.

However, similar to the results in 2.4, there is no significant p-value once the chi-square test is run on the variables gender and green consumerism. It results in a p-value of 0.5355, which is greater than 0.05. This means there is no significant difference in consumers' likelihood to adopt green consumerism due to gender. Gender has a different influence on in practice green consumerism behaviour and theoretical green consumerism.

#### (3.1) Not a lot of customers are willing to pay more for green products.

Not accepted, from the bar chart (figure 1) can be concluded that the red label is not always chosen. For every price increase version, the yellow and green labels are chosen at least 30% out of the total options. Especially for the 5% price increase the green labelled food product is the most chosen product. Thus, despite the price increases, the more sustainable labels (yellow and green) are still being chosen.

#### (3.2) There is a gap between green consumer intentions and behaviour.

Not accepted. Within this research the green consumer intentions can be defined by the variable green consumerism. The behaviour can be derived from the count on the colour of the products' label. Once the chi-square test is run on the variables green consumerism and label colour, a p-value of 2.2e-16 is the results. (Tables and figures, 7) Which is very small thus implies a significant association between the two variables. From the contingency table can be seen that green consumers chose for 40% green labels and the non-green consumers for only 2%. 88% of the non-green consumers chose the red labelled product and 26% of the green consumers. The green consumer variable is related to the actual behaviour, so there is no gap.

# (4.1) Whether the consumer can afford the products is a key factor that will help into a greener purchase behaviour.

As is described in hypothesis 2.4 (Tables and figures, 5), there is a significant influence on the buying behaviour of the participant once the income is compared with the actual consumer behaviour. On the contrary, looking at the theoretical green consumerism there is no significant value. Being able to afford sustainable products has no significant influence at the theoretical green consumerism, but does have a positive significant influence at the actual behaviour of the consumer.

# (5.1) Ecological labels would lead to more sustainable food choices, compared to products which are not labelled (especially young adults).

The hypothesis that ecological labels would lead to more sustainable food choices is accepted. The labels do have a positive impact on the product choices of the consumers as can be seen from the barchart in figure 3. So ecological labels will lead to more sustainable food choices. The limitation to this is that the research only focuses on more sustainable choices between the same food product. In addition, this research does not include non labelled products.

The part of the hypothesis that especially young adults are influenced, is not accepted in this research. The contingency table in (Tables and figures, 8) shows that young adults (14-29) are more inclined towards the red or yellow label and that the eldery participants more towards green labels. In this research especially older

consumers (29+) are influenced to make more sustainable food choices. Thus this part is not accepted.

# (6.1) If the consumer has trust in the eco label, they are more likely to use the label in their purchase decision.

Accepted. The chi-square test is performed on the variables trusted in ecolabel and the colour of the label. Which results in p-value = 0.00512. (Tables and figures, 9) There is a significant difference in the trust on the provided eco labels and the label that they choose.

When the 7 point Likert scale of the variable trust is categorised into three categories (no trust, neutral and trust) then the following results are extracted: p-value of p= 0.0002794, which results in a higher significance level and acceptance of the hypothesis. Consumers who trust the provided label are more likely to choose a more sustainable product, which implies that they use the label in their purchase decision. 50% of the participants indicate that they trust the provided eco label. Whether this trust is gained bij the sentence "The provided labels are footprint labels which are certified by a third party.", which was included in the question, is not tested.

# (7.1) Results showed that purchase intentions on green products could be influenced by their eco consciousness.

Accepted. The results in this research show that eco consciousness has a significant influence on the product choice. Since the p-value is below 0,05 (2.348e-16) and the contingency table shows that eco conscious participants chose more green labelled products than neutral or not eco conscious participants. Thus, eco consciousness has a positive influence on the purchase intentions on green products The limitation is that the eco consciousness is tested with a different method than in the other paper, which can influence the classification of the consumers eco consciousness.

### (7.2) Key factors that affect the carbon labelled milk purchasing are for example; environmental awareness and educational level. Income and attitude towards risk can be neglected.

For the contingency tables and results see Tables and figures, 11.

- Environmental consciousness affects labelled purchasing: accepted (see results in 7.1)
- Educational level: Accepted. The test on education level gave a p-value of 2.2e-16, which implies that the educational level of the participant has a significant influence on the consumption choice. Higher educated people (master or pHD) are more likely to buy green labelled products. This can also be the result of the higher age and income in the higher educational level group.
- As described in the results of 2.4, income does have a significant influence on the actual labelled purchasing behaviour of the consumer, but not on the theoretical green consumerism.
- Attitude towards risks is a part of the personality trait openness to experience. If we look at the characteristic trait "Openness to new experiences" there is a p-value of 0.0005639, which is significant. This hypothesis can be neglected. Openness to experience does have a significant influence on the label choice.

(8.1) Carbon footprint labels have a positive influence on the consumers' product choice when they know the meaning of the label and when they are eco conscious.

This result is similar to the results from 1.3. This research did not test the understanding of the label before and after choosing the product. In the survey questions a small explanation was added, to ensure participants' understanding of the eco label.

(8.2) The more environmentally concerned the customer is, the bigger the impact of the carbon label.

This research did not specifically test the environmental concern, but did look at the environmental consciousness. The results from this research are described in 1.2.

(9.1) Living without your parents as a student influences your choices

Accepted. In this research students living without their parents are defined by the variable multi-persons households in question 'housing status'. In the contingency table there is a clear difference between couples/adults and the multi-person households/children living with their parents. The first group is more likely to buy green labelled products compared to the second group. Living without your parents as a student does influence your choices. It is a negative influence in the sense of sustainable choices.

(9.2) Cooking skills and confidence often influences the choices

Only the participants who strongly agree with enjoying cooking their own meals are more likely to buy green labelled products. When we categorise the 7 point Likert scale 1-7 in a 'does not like' (score 1-3), 'neutral' (4) and 'likes' (score 5-7), then there is no significant difference in preference of cooking your own meal and product choice (p-value = 0.4306). Whether consumers like to cook their own meals does not influence their consumption choice.

### 4.2.2 Multinomial logistic regression

The multinomial logistic regression model is run on the demographic variables, random variables, environmental consciousness + green consumerism and the personality traits. The complete dataset is used since the different versions of the survey separately have a sample that is too small to make a good prediction for the MLR.

The reference level is set on the red label, because the red labelled product has the same price in every survey version. Besides that, this price is based on the products on ah.nl and it is the label from which sustainable improvement can be achieved.

For the MLR model a few steps are taken. First, the data is split in a training and a test set (70%/30%). Corresponding to the other tests, the dependent variable is the colour of the label on the food product (red, yellow or green labelled) and the independent variables are listed in appendix 1. The independent variables and dependent variables from the training data are put into the multinomial logistic regression model. From there the p-value is calculated via the two tailed z-test. Only if the independent variables have a significant p-value (p<0,05), they will be included in the model. The prediction table, accuracy and misclassification percentage are calculated for the training and the test set. An accuracy of at least 35% is expected since the red and green label is chosen 34% of the time. For example, we could classify all variables into the red label and then the results will still show an accuracy of 34%. For that reason we want the accuracy of the prediction of our model to be 35% or higher.

The assumptions of the multinomial logistic regression model need to be tested before using the model on the data. The first assumption is that there should be no multicollinearity. The second is that the independent variables are linearly related to the logit of the dependent. And the third one is that there should be no outliers.

The first assumption is checked through Pearson's correlation. The independent variable is perfectly correlated once the coefficient is close to 1 or -1. The independent variables from the dataset were not highly correlated to each other. Only the variable household and housing status are correlated with age (>0.7). Besides these, this assumption validated all other variables. The second assumption of linearity was tested by scatterplots on the independent variable and the logit of the dependent variable. From these scatterplots could be determined if the variable had a linear relationship. The variables income and emotionally stable did not meet the assumption of linearity. For the last assumption the outliers are detected by plotting a boxplot for each variable. All the variables of the personality traits had some outliers. There is no evidence that the outliers are caused by participants who randomly filled in the questions and the outliers are not far from the mean value. Thus these outliers were considered irrelevant and the variables are still considered in the model.

The results of each model are summarised in table 3.

#### Model 1: Demographic variables

The variables *level of education, employment status, housing status, living area and household* of the demographic section were tested in the MLR model. The variables with a small p-value were added in the final model.

The variable education had p-values above the significant level of 0,05, thus was not considered any further. The other variables did have significant p-values, thus were used in the MLR model. It gave an accuracy on the training set of 51% and on the test set of 46%. The total accuracy of 46% on the test set is higher than the minimum value, thus the model with the demographic variables is a good fit on the data.

#### Model 2: Eco consciousness and green consumerism

An average score of the variables environmental consciousness and green consumerism is calculated to determine the final rating for each participant. Both variables consist of four questions with an appliance on the 7-point Likert scale. For each participant the average of the four questions is calculated and these are put into a new column. The average score of both variables is used as the independent variable for the multinomial logistic regression model. The environmental consciousness and green consumerism have a p-value under the significance level of 0,01, therefore we keep both of the variables in our model. The overall accuracy on the training data is 50% and on the test data 46%. This is above the minimum accuracy of 35%.

#### Model 3: Personality traits

There are five personality traits; extraversion, agreeableness, conscientiousness and openness to experience. The survey included two questions for each personality trait. Participants could rate how much the questions applied to them based on the 7 point Likert scale. The average of the two questions was taken to give a final rating on the similarity on the personality trait of the participant. Each average has been placed in a separate column which is used for the multinomial logistic regression model.

The calculated p-values are; extraversion (p > 0,05), agreeableness (p < 0,05), conscientiousness (p < 0,01) and openness to experience (p > 0,05). The independent variables extraversion and openness to experience are not significant, for that reason they are left out in the regression model. Agreeableness and conscientiousness are included in the MLR. The accuracy of the training model is 39% and for the test set it is 34%. These accuracy percentages are around the minimum accuracy, thus not very accurate.

### Model 4: Price increases

The different price increases were also tested in the MLR model. Each version of the survey is given a label corresponding to the price increase. The dataset has a column 'price' with 4 levels; 5%, 10%, 20% and 20%+. The MLR model was run on the independent variable *price increase* to predict the dependent variable label. The predictor price increase gave an accuracy value slightly above the minimum value. The training set had an accuracy of 40% and the test set of 42%.

### Model 5: All variables

There are some tests executed with different combinations of variables from the complete dataset. First the MLR was run on all the independent variables except the variables that did not meet the assumptions. The variables with an insignificant p-value (>0,05) were deleted from the model and the MLR model was run again on the new combination of significant variables. The variables with all insignificant p-values were; preference online purchasing, sleep, hours per day on phone, personality trait extraversion, personality trait conscientious, personality trait emotionally stable, personality trait openness to experience and the price increase. Deleting these from the model resulted in an accuracy of 62% on the training set and 55% on the test set.

Furthermore tests were run on random combinations of variables. The combinations with the highest accuracy are discussed in this section.

### Model 6: Available characteristics

To apply the test on a more realistic scenario the independent variables which will be included in the model are characteristics that are known to a company, for example a supermarket. Not every characteristic of the customer in this research will be known to the supermarket. By letting the customer use a loyalty card, they are able to extract some data. For example the customers' age, living area, frequency of weekly grocery shopping, preference for online grocery shopping and the price increase that they are willing to pay. Using these variables in the MLR model will result in an accuracy of 48% on the test set. Furthermore, frequent use of the loyalty card and analysis of users data can also help in estimating the customers' eco consciousness, green consumerism and whether they like to cook their own meals. Adding these variables in the model will result in an accuracy of 54%. These models do not have the highest overall accuracy, but are constituted by using more realistic available user data.

### Comparing the models:

The accuracy scores on the training and test set of each model are far above the minimum accuracy of 35%. Looking at table 3 more parameters are calculated based on the test set. The no information rate is similar for each model. The model is significant once the p-value is > 0.05. Given the values in table 3, the p-value in model 3 is the only p-value which is not significant since it has a p-value of 0.78 > 0.05. Cohen's Kappa measures the strength of

agreement. Guidelines state that a value lower than 0.2 is considered as a poor strength of agreement and values between 0.21 and 0.40 are considered as fair. [32] By interpreting these numbers based on the guidelines, only model 5 and 6 perform fairly. From model 5 and 6, the values of the Wald Z, 2-tailed z test and coefficients are listed in the appendix 2.2.

Model	Variables included	Accuracy training/ test set	CI 95%	No info rate	P-value [Acc > NIR]	Карра
1:	Employment status, Housing status, Living area, Household,	51% / 46%	(0.3907, 0.5252)	0.3587	0.001539	0.1959
2:	Eco consciousness, Green consumerism	50% / 46%	(0.3916, 0.5234)	0.3664	0.002889	0.1767
3:	Agreeableness, Conscientiousness	39% / 34%	(0.2812, 0.4112)	0.367	0.7794	0.0378
4:	Percentage price increase	40% / 42%	(0.3511, 0.4903)	0.3512	0.0251631	0.1354
5:	Education, Employment status, Housing status, Living area , Household, Frequency grocery shopping per week, Preference cooking own meals, Eco consciousness, Green consumerism, Agreeableness	62% / 55%	(0.4844, 0.6211)	0.3535	1.742e-09	0.3293
6:	Age Living area, Frequency of weekly grocery shopping, Preference for online grocery shopping, Price increase that they are willing to pay, Eco consciousness, Green consumerism, Preference for cooking own meals	58% / 54%	(0.4681, 0.6063)	0.3962	2.142e-05	0.305

Table 3: summary MLR models

## Discussion

One research from the existing literature stated that price incentives and labels could help the consumer choose. [11] The present study proved that sustainable labels do have a significant influence and support consumers in making more sustainable choices. Price incentives are not even necessary, on the contrary consumers are willing to pay extra for more sustainable products. This can be confirmed by looking at figure 3 which shows the product choices per label for each version separately and for the dataset as a whole. Only 34% of the total choices were red labelled (least sustainable option) products, which shows that not every consumer chooses the red labelled product. In almost  $\frac{2}{3}$  of the questions where participants could choose their preferred product, they chose a yellow or green labelled product above the red labelled product. From this it can be derived that the coloured labels influence the buying behaviour of the consumer in the advantage of the more sustainable products. Furthermore it proves that consumers are willing to pay more for a product which is differentiated with a better sustainable label. As more consumers chose the more expensive yellow and green labels.

Looking at the versions separately, the first thing to notice is the high percentage in choices for the green labelled products in the '5% price increase' version. The second is the high percentage of choices for the red labelled products in the '10% price increase' version. It is not plausible though that the difference in counts is caused by the higher price increase. As the choices in the '20% price increase' and '20% price increase + social sustainability' are distributed equally despite their high price increase. To examine this difference further the variables in the different price increase versions are compared via table 1. As is stated in the results section, the '10% price increase' version contains a relatively high percentage of students. A lower income and budget is characteristic for this group, which results in a lower willingness to pay for a more sustainable label. This may be a more logical explanation for the relatively high count of the red labelled products. This is not to be seen as an indication that students are not environmentally conscious. The variables environmental consciousness and green consumption have similar high scores throughout all the versions, although the results in the barchart do not show actual green consumer behaviour. Indicating that students are environmentally conscious and are likely to adopt green consumerism. which can be seen as a positive sign. When their circumstances are more favourable, students are expected to put sustainable consumption behaviour into practice.

Consumers are willing to pay extra for a more sustainable label, although their price sensitivity differs per product. From table 2 can be seen that the products crisps, bananas, tea and bread have the highest choice count for the green label. Meaning that they are willing to pay more for these products. In all of the cases where the participant could choose between red, yellow or green labelled olive oil 45% chose the red labelled and cheapest version. The same happened for beer where 50% chose the red labelled and cheapest beer. Compared to the other products these are high percentages for the red labelled products. This difference is probably caused by the difference in price of the products. Olive oil and beer were the two most expensive products in the survey. As the price increase is a percentage and not absolute it results in an even higher price increase for the more sustainable label. Apparently consumers are not willing to pay the extra price increase for the already more expensive products, as a consequence the consumer is more inclined

towards the red or yellow label for that product. It can be concluded that the willingness to pay more for a sustainable label is higher for cheap food products than for expensive products. Or, formulated differently, the price sensitivity is lower for cheaper food products in combination with sustainable labels. This should be taken into account when pricing labelled food products.

The chi-square test revealed that most of the variables are significantly associated with the colour of the label. Only three of the five personality traits in the complete dataset (with in total 19 variables) and three variables in the '10% price increase' version are not significant. The chi-square tests were used for verifying the results from the literature review and to derive findings for this study. The variable income does show some interesting results on the chi square tests. The variable green consumerism is a theoretical score based on four questions from the survey. For this variable income does not show a significant association, which means the variables income and green consumerism are independent. However when the test is run on the variables income and the actual consumption behaviour (namely, counts per colour of the products' label) it does give a significant p-value, indicating they are dependent. This shows that there is a difference between the green consumerism derived from the oretical implications (the four questions in the survey) and the green consumerism derived from the actual behaviour (counts of the coloured labels). This research sees actual behaviour as the most important factor.

The results from existing literature are quite consistent with the results from this research. The few main findings are that in the '10% price increase' version the consumer is not much inclined towards green labelled products. The possible cause for this is elaborated above. Furthermore consumers are likely to adopt green consumerism when they are eco conscious, have a higher income, trust the provided label and have reached a higher educational level. Contrary, the characteristics of living without your parents, having a lower income and being younger (under the age of 29) have a negative influence on adopting green consumerism. From the results can be seen that these factors have a negative influence on making more sustainable choices. This difference could be explained by age and income, the couples and adults are older and have a higher income, for that reason their willingness to pay more for a more sustainable label is higher than the students and children. But as indicated before, the lower age group does have a similar score on eco consciousness compared to the other groups, which indicates that there is a great chance that they will adopt green consumerism in the future when they are older and have a higher income.

From the multinomial logistic regression models can be derived that different kinds of models can result in a high accuracy on predicting the consumers choice of colour of label. Some tests were run on random combinations of data. The highest accuracy is obtained by model 5. For model 6 more realistic variables were used. By using consumer characteristics (e.g. collected by loyalty cards), the consumers' choice of label could be predicted with an accuracy of 54%. Consumer characteristics are therefore key for successfully targeting consumer groups.

## Conclusion

This research contributes to a better understanding of the impact of using sustainable labels on food products. From the findings of this research it can be concluded that sustainable labels have a positive influence on the consumers behaviour. As  $\frac{2}{3}$  of the participants chose yellow or green labelled food products instead of the red labelled products. In addition to that, the research shows that consumers are willing to pay extra for more sustainable labelled products. Even for products with a 20% price increase 67% of the consumers were willing to pay the price difference.

To answer the research question: Which factors influence the buying behaviour of the customer towards food products when they are labelled with carbon labels and are differentiated with a higher price? The factors that influence the buying behaviour the most are the consumers' eco consciousness and trust in the label. Also demographic factors, such as age, income, household and educational level influence the behaviour. Especially from the age of 29, higher income groups and highly eco conscious participants were likely to adopt green consumerism. Although we do see that younger consumers (e.x. students/living without parents) do not adopt the green consumerism, it can be derived that they are likely to do so in the future. Most of the personality traits did not have a significant influence on the choice of the label, only conscientiousness and openness to experience did show a significant result. Which can imply that consumers who are open to experience and try a lot of new products, are more likely to be influenced by a sustainable label. The results derived from existing literature are in line with these findings.

Consumers are not willing to pay a higher price for every product. From the research it can be concluded that consumers are willing to pay the extra price increase for cheaper food products, such as bananas and bread. However consumers are more inclined towards the less sustainable and cheaper choice for the more expensive products. So consumers' willingness to pay more for a sustainable label is higher for cheap food products than for expensive products. Companies should adjust their price strategies to that.

The impact of this research to society is that it provides input for marketing to target specific customers. Now that it is known which characteristics influence the buying behaviour of the customer, it is possible to respond to them. For example, supermarkets can present discounts to different groups of customers on the loyalty card. In general consumers are willing to pay more for a product with a more sustainable label. Companies can incorporate an additional premium in the product price to cover the extra costs for sustainable product. Also lower income groups who are less likely to pay for a more sustainable product, might be stimulated to buy more environmentally friendly products by offering them a personal discount.

Within the experimental design section different kinds of sustainable labels were evaluated. It is suggested to use comparable traffic light coloured labels combined with brief and easy to understand information. Besides that, trust in the label should be created through a third party certification. By applying these options, the label will have the most positive impact on the buying behaviour of the consumer. Also in general green sustainable labels help to improve a company's image, making them more attractive.

In conclusion, there is a lot of potential in labelling food products with sustainable labels. Most consumers are eco conscious and are inclined towards green consumer behaviour. Once there are clear, comparable and reliable sustainable labels for food products the majority of consumers will be influenced by these. In addition to that they are willing to pay a price premium for green options. Once companies adjust their marketing strategy to target specific customers based on the research finding buying behaviour can be influenced towards the sustainable food product labels.

# Limitations

A first limitation is the experimental design of this research. Participants were in an unrealistic grocery shopping environment which could influence their consumer behaviour. For example, the participants did not have to pay for the products that they chose. Therefore they could easily choose a more sustainable product without actually paying the extra costs. Besides that, in the real market environment consumers are influenced by a lot of factors (e.x. brands and discounts). In this experiment they were solely influenced by the sustainable label. These kinds of factors in a real grocery store could influence the consumers behaviour towards sustainable labels. More tests can be carried out in the field to find out how consumers behave.

A second limitation is that the experiment group contains all participants from the Netherlands and most of the participants are highly educated. So it is not known how other groups and cultures behave. Future research could be conducted in different cultures and among a more variated target group.

The goal of the sustainable labels is to reduce the total GHG emissions generated by food consumption. Advantages through a more sustainable production could be obtained. A disclaimer is that the eating habits of the consumers have the biggest impact on the environment, thus labelling products in the same food categories is not the only solution. Changing the consumers diet to less animal product consumption and a more modest intake of caloric will also have a significant impact on the GHG emission reductions. [22] Although changing behaviour is not easy, there could be more studies on how to influence the eating habits of the consumer. This could be done by the use of sustainable (traffic light coloured) labels among different kinds of product categories.

Once it has been proven that sustainable labels have a positive influence on the consumption behaviour and that it obtains a reduction of the GHG emissions, there should be a wide application of the label by producers. A limitation of this is that it should be obtained through regulations, since producers with a red labelled product are not reasoned to label their product with the worst sustainable label. Legal regulations should oblige producers to label all food products with the green, yellow and red eco label. [8] It could take time and resistance to implement these regulations. In addition to that, a guideline should be made to categorise the products.

# Appendix

### 1: Survey questions

### Demographic information

- Gender (categorical)
  - Male, Female, Other
  - Age (categorical)
    - Integer
    - Categorised for chi-squared test in: "14-29", "29-44", "44-59", "59-74"
- Country (categorical)
  - Netherlands
- Level of education (categorical)
  - Some high school, High School, VET/MBO, Bachelor degree, Master Degree, PHD or higher
- Employment status (categorical)
  - Working full-time, Working Parttime, Student, Retired, Other
- Gross income per month
  - Integer
  - Categorised for chi-squared test in: "0k-5k", "5k-10k", "10k-15k", "15k+"
- Industry of your work
  - Deleted -> too distributed
- Current housing status (categorical)
  - Owner-occupied, without mortgage or housing loan; Owner-occupied, with mortgage or housing loan; Tenant, rent at market price; Tenant, rent at reduced price or fee
- Living area (categorical)
  - Rural area, Town/suburb, City
  - Current household (categorical)
    - Couple without children, Couple with children, Single adult without children, Single adult with children, Child living at home, Multi person household

### <u>Random</u>

- Frequency of weekly grocery shopping
  - 0, 1, 2, 3, 4, 5, 6, 7
- Preference for online purchasing (categorical)
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- Hours of sleep last night
  - · 3, 4, 5, 6, 7, 8, 9, 10
- Like to cook meals (categorical)
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- Daily hours spend on the phone
  - 0 1, 2, 3, 4, 5, 6, 7

### Environmental consciousness

- Awareness of impact of food production on the environment
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- Encourage others to buy green-labelled food products
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I always choose the most sustainable option
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

- Irritation when someone does not take the environmental impact into account
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree little, Agree moderately, Agree strongly

Categorised for chi-square test: average of the four questions was taken and categorised in: disagree (score 1-3), neutral (4), agree (5-7)

### <u>Green consumerism</u>

- I am willing to pay more for green products
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- Change brand loyalty for green products
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I am willing to spend more effort in buying green products
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I trust the provided eco-labels on products
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

Categorised for chi-square test: average of the four questions was taken and categorised in: disagree (score 1-3), neutral (4), agree (5-7)

### Personality traits

### Extraversion

- I see myself as Extroverted, Enthusiastic (R)\*
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I see myself as Reserved, Quiet
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

### Agreeableness

- I see myself as Critical, Quarrelsome (R)\*
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I see myself as Sympathetic, Warm
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

### Conscientiousness

- I see myself as Dependable, Self-disciplined
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I see myself as Disorganised, Careless (R)\*
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

### Emotionally stable

- I see myself as Anxious, Easily upset (R)\*
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strong ly
- I see myself as Calm, Emotionally stable
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

### Openness to experience

• I see myself as Open to new experiences, Complex

- Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly
- I see myself as Conventional, Uncreative (R)\*
  - Disagree strongly, Disagree moderately, Disagree a little, Neither agree nor disagree, Agree a little, Agree moderately, Agree strongly

Categorised for chi-square test: average of the two questions was taken and categorised in:

Applies (score 1-3), neutral (4), does not apply (5-7)

\* Denotes a reversed scoring

### 2: Tables and figures

### 2.1 Verifying literature review

### 1: contingency table and chi-square test; result 1.2

Chi-square test on colour of label and eco consciousness

Colour of label	Red	Yellow	Green
Eco consciousness			
Disagree (score 1-3)	87	49	39
Neutral (4)	95	82	54
Agree (score 5-7)	53	91	150

Pearson's Chi-squared test

X-squared = 79.388, df = 4, p-value = 2.348e-16

### 2. contingency table and chi-square test; result 2.1

#### Chi-square test on eco consciousness and gender

Eco consciousness Gender	Disagree (score 1-3)	Neutral <i>(score 4)</i>	Agree (score 5-7)
Male	10	13	23
Female	15	20	18
Other	0	0	1

X-squared = 3.9972, df = 4, p-value = 0.4064

### 3. contingency table and chi-square test; result 2.2

Chi-square test on eco consciousness and income

Eco consciousness	Disagree	Neutral	Agree
Income	(score 1-3)	(score 4)	(score 5-7)
0-5k	24	27	28

5k-10k	1	2	8
10k-15k	0	2	2
15-20k	0	1	1
20k+	0	1	3

X-squared = 10.306, df = 8, p-value = 0.2442

#### 4. contingency table, chi-square test and Spearman's correlation; result 2.3

Chi-square test on green consumerism and eco consciousness

Green consumerism Eco consciousness	Disagree (score 1-3)	Neutral (score 4)	Agree (score 5-7)
Disagree (score 1-3)	5	10	10
Disagree (score 1-3)	2	9	22
Disagree (score 1-3)	1	4	37

X-squared = 18.325, df = 4, p-value = 0.001066

Spearman's rank correlation: S = 65827, p-value = 2.618e-11, rho = 0,6049965

### 5. contingency table and chi-square test; result 2.4

Chi square test on colour of labels and income

Colour of label	Red	Yellow	Green
Income			
0-5k	214	179	160 (29%)
5-10k	8	22	47 (64%)
10-15k	3	7	18 (64%)
15-20k	1	12	1 (7%)
20k+	9	2	17 (60%)

Pearson's Chi-squared test

X-squared = 79.125, df = 8, p-value = 7.333e-14

### Chi square test on green consumerism and income groups

Green consumerism Income	Disagree (score 1-3)	Neutral (score 4)	Agree (score 5-7)
0-5k	7	19	53
5k+	1	4	16

Pearson's Chi-squared test

X-squared = 0.72813, df = 2, p-value = 0.6948

### Chi square test on green consumerism and income

Green consumerism	Disagree (score 1-3)	Neutral (score 4)	Agree (score 5-7)
Income			
0-5k	7	19	53
5k-10k	0	3	8
10k-15k	0	1	3
15-20k	1	0	1
20k+	0	0	4

Pearson's Chi-squared test

X-squared = 8.2619, df = 8, p-value = 0.4083

### 6. contingency table and chi-square test; result 2.5

Chi-square test on colour of label and gender

Colour of label	Red	Yellow	Green
Gender			
Male	96	89	137
Female	139	131	101
Other	0	2	5

P-value = 0.0001263

### Chi-square test on green consumerism (categorised) and gender

Colour of label	Disagree	Neutral	Agree
	(score 1-3)	(score 4)	(score 5-7)
Gender	, , , , , , , , , , , , , , , , , , ,	, ,	

Male	2	9	35
Female	6	14	33
Other	0	0	1

X-squared = 1.1348 , df = 4, p-value = 0.5355

#### Chi-square test on green consumerism and gender

Green consumerism Gender	2	3	4	5	6	7
Male	1	1	9	16	14	5
Female	2	4	14	19	12	2
Other	0	0	0	0	0	1

Pearson's Chi-squared test

X-squared = 15.884 , df = 10, p-value = 0.103

Green consumerism Gender	Disagree (score 1-3)	Neutral (score 4)	Agree (score 5-7)
Male	2	9	35
Female	6	14	33
Other	0	0	1

Pearson's Chi-squared test

X-squared = 3.1348 , df = 4, p-value = 0.5355

### 7. contingency table and chi-square test; result 3.2

Chi-square test colour on label andon green consumerism (categorised)

Colour of label	Red	Yellow	Green
Green Consumerism			
Disagree (score 1-3)	49 (88%)	6	1 (2%)
Neutral (score 4)	59 (37%)	54	48 (30%)
Agree	127 (26%)	162	194 (40%)

(score 5-7)			
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X-squared = 87.79, df = 4, p-value < 2.2e-16

dfr

### 8. contingency table and chi-square test; result 5.1

Age (Q3)	Red	Yellow	Green
14-29	192	114	93
29-44	6	21	15
44-59	27	69	100
59-74	10	18	35

Chi-square test on colour of label and age of participant

### 9. contingency table and chi-square test; result 6.1

Chi-square test	on colour	of label and	trust in the label
0111 0944410 1001			

Colour of label	Red	Yellow	Green
Trust in label			
No trust (34%)	106	66	66
Neutral (16%)	32	42	38
Trust (50%)	97	114	139

X-squared = 21.274, df = 4, p-value = 0.0002794

### 10. contingency table and chi-square test; result 7.1

### Chi-square test on colour of label and eco consciousness

Colour of label	Red	Yellow	Green
Eco Consciousness			
Disagree (score 1-3)	87	49	39
Neutral (score 4)	95	82	54
Agree (score 5-7)	53	91	150

Pearson's Chi-squared test

X-squared = 79.388, df = 4, p-value = 2.348e-16

### 11. contingency table and chi-square test; result 7.2

Chi-square test on colour of label and level of education

Colour of label	Red	Yellow	Green
Level of education			
Some high school	1	6	14
High School	106	50	40
VET/MBO	7	11	3
Bachelor degree	104	102	95
Master degree	16	48	76
PHD or higher	1	5	15

X-squared = 106.62, df = 10, p-value < 2.2e-16

### Chi-square test on colour of label and the personality trait openness to experiences

Colour of label Openness to experiences	Red	Yellow	Green
Not open to new experiences	7	0	7
Neutral	27	15	42
Openness to new experiences	201	207	194

Pearson's Chi-squared test

X-squared = 19.733, df = 4, p-value = 0.0005639

### 11. contingency table and chi-square test; result 9.1

Chi-square test colour on label and household status

Colour of label Household	Red	Yellow	Green
Couple without children	32	57	79
Couple with children	23	39	43
Single adult without children	22	16	18

Single adult with children	2	15	32
Child living at home	13	12	10
Multi Person household	143	83	61

X-squared = 90.164, df = 10, p-value = 4.969e-15

#### 11. contingency table and chi-square test; result 9.2

Chi-square test on colour of label and preference for cooking own meals

Colour of label	Red	Yellow	Green
Preference cooking			
No	17	16	19
Neutral	18	15	16
Yes	200	191	218

Pearson's Chi-squared test

X-squared = 3.822, df = 4, p-value = 0.4306

### 2.2 Multinomial logistic regression model

#### Model 5:

Wald Z

> z (Intercept) education2 education3 education4 education5 education6 employStatus2 employStatus5 employStatus6 Yellow -2.228340 -0.4302465 -0.4384479 -0.1857699 0.01153804 -0.2226059 -0.06462724 0.2886647 0.01273125 -1.904804 -0.8632711 -1.3301414 -0.9023807 -0.36304790 -0.4356296 -0.54644666 0.7438888 -0.55354444Green employStatus7 housingStatus2 housingStatus3 housingStatus4 livingArea2 livingArea3 household2 household3 Yellow 1.4149572 2.674349 0.06529878 -0.1556973 2.542965 3.266219 -0.2366334 -0.8772752 Green -0.13976911.044858 1.08937988 2.2832115 2.653974 3.657188 -0.2448269 -2.9115940 esGrocery cooking2 cooking3 cooking4 cooking5 cooking6 cooking7 -1.167485 -2.417197 -8.354122e-01 -1.471349 -1.922693 -1.825949 -1.303940 household4 household5 household6 timesGrocery cooking2 Yellow 0.573208 0.5615672 1.303127 1.303127 0.573208 0.5615672 1.734245 -1.174663 -3.0565468 Green 1.042919 -2.370655 -1.379351e+05 -1.908504 -3.201078 -2.765683 -1.869123 meanGC meanAgree meanEC 2.477953 Yellow 2.236334 3.019205 Green 1.225673 5.119671 1.194391

#### 2-tailed z test

> p (Intercept) education2 education3 education4 education5 education6 employStatus2 employStatus5 employStatus6 0.6670163 0.6610617 0.8526252 0.9907942 0.8238422 0.3879884 0.1834717 0.3668547 0.7165691 0.6631055 Yellow 0.02585782 0.9484708 0.7728380 0.9898422 0.05680558 0.5847589 0.4569437 0.5798907 Green employStatus7 housingStatus2 housingStatus3 housingStatus4 livingArea2 livingArea3 0.1570811 0.007487456 0.9479361 0.87627166 0.010991614 0.0010899377 livingArea3 household2 household3 Yellow 0.8129412 0.380337195 Green 0.8888424 0.296088722 0.2759864 0.02241791 0.007954997 0.0002549969 0.8065904 0.003595897 household4 household5 household6 timesGrocery cooking2 cooking3 cooking4 cooking5 cooking6 cooking7 0.19253147 0.5665039 0.574410933 0.2430145 0.01564055 0.4034856 0.14119682 0.054518626 0.067857970 0.19225400 Yellow 0.19253147 Green 0.08287469 0.2401297 0.002239025 0.2969858 0.01775661 0.0000000 0.05632613 0.001369146 0.005680379 0.06160573 meanEC meanGC meanAgree Yellow 0.02532989 2.534390e-03 0.01321384 Green 0.22032165 3.060687e-07 0.23232489

#### Exponentiated coefficients

(Intercept) education2 education3 education4 education5 education6 employStatus2 employStatus5 employStatus6 Yellow 0.002066953 0.4055114 0.38133095 0.6742154 1.0247515 0.5786610 0.9595301 1.206782 1.0286121 Green 0.004600791 0.1653888 0.05235366 0.1495873 0.4679322 0.3485689 0.6888684 1.682886 0.3041399 employStatus7 housingStatus2 housingStatus3 housingStatus4 livingArea2 livingArea3 household2 household3 household4 5.6413444 vellow 5.421811 1.891398 1.058862 0.8636116 2.628403 8.5701251 5.415725 8.502528 0.8604125 0.47315454 6.191576 10.580575 0.8499607 0.09307547 4.802882 0.8037759 8.172316 Green household5 household6 timesGrocery cooking2 cooking3 cooking4 cooking5 cooking6 cooking7 meanEC 1.7347190 1.55148511 0.8792733 0.005672209 3.601030e-01 0.15821629 0.15173617 0.16995697 0.2791534 1.429818 Yellow 0.2994768 0.09555828 1.1232838 0.009411986 1.206449e-06 0.08571786 0.03750054 0.06455493 0.1570817 1.228817 Green meanGC meanAgree Yellow 1.794831 1.549264 Green 3.115217 1.271180

#### Model 6:

Wald Z

> Z

 
 (Intercept)
 age
 livingArea2
 livingArea3
 timesGrocery
 onlinePurchasing2
 onlinePurchasing3
 onlinePurchasing4

 Yellow
 -3.518891
 4.127305
 0.8199152
 1.049957
 -0.03677212
 1.703049
 0.4926264
 0.8527077

 Green
 -4.968382
 4.419188
 0.8854564
 1.856477
 1.23331924
 -1.119129
 -0.8513036
 -0.2529975
 onlinePurchasing5 onlinePurchasing6 onlinePurchasing7 price10% price20% meanEC meanGC cooking2 v 2.4800404 0.4647641 1.1241759 -0.9140773 0.2090459 0.2023867 3.138309 -237180490 -0.1648489 -0.4721572 0.22440724 -1.8333219 -1.9948714 1.7022377 4.446546 3904594 Yellow Green 
 cooking3
 cooking5
 cooking6
 cooking7

 yellow
 1.189982e-01
 -0.4183308
 -0.5268406
 -0.4287275
 0.2477186

 Green
 -2.675494e+06
 -0.1470588
 -0.8770088
 -1.1820347
 0.1118652
 Green

#### 2-tailed z test

> p

 
 (Intercept)
 age
 livingArea2
 livingArea3
 timesGrocery
 onlinePurchasing2
 onlinePurchasing3
 onlinePurchasing4

 Yellow
 4.333547e-04
 3.670392e-05
 0.4122644
 0.29373768
 0.9706667
 0.08855898
 0.6222766
 0.3938214

 Green
 6.751374e-07
 9.907245e-06
 0.3759105
 0.06338555
 0.2174567
 0.26308528
 0.3946007
 0.8002701
 meanGC cooking2 cooking3 9255e-03 0 0.9052768 Yellow 0.8071748 0.06675471 0.04605691 0.08871083 8.726198e-06 0.86906292 0.6368146 0 0.0000000 Green cooking4 cooking5 cooking6 cooking7 Yellow 0.6757053 0.5983043 0.6681216 0.8043522 Green 0.8830856 0.3804818 0.2371919 0.9109303

#### Exponentiated coefficients

(Intercept) age livingArea2 livingArea3 timesGrocery onlinePurchasing2 onlinePurchasing3 onlinePurchasing4 Yellow 0.009508189 1.047584 1.62129 1.850663 0.9965273 2.4927390 1.3109798 Green 0.001029758 1.055063 1.721974 3.021909 1.1297891 0.5320239 0.6275298 1.5233370 0.8827453 onlinePurchasing5 onlinePurchasing6 onlinePurchasing7 price10% price20% meanEC cookina2 cookina3 meanGC 1.2472594 2.302742 0.7013317 1.0710709 1.029313 1.615933 5.760465e-03 1.121716e+00 Yellow 3.2653634 Green 0.9209401 0.7958552 1.201872 0.4713836 0.5088553 1.303101 2.319440 3.352115e+05 4.622372e-07 cooking4 cooking5 cooking6 cooking7 Yellow 0.6705610 0.6547364 0.7172079 1.215672 Green 0.8620788 0.4506843 0.3618277 1.100711

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