



**Fruit and Vegetables
Packaging Solution**
APPENDIX

Nathan Blaak
Graduation project
| 2018 - 2019

Table of contents

- I. Interviews
- II. Consumer interviews
- III. Research
- IV. Materials
- V. Ideation
- VI. Amount of packaging
- VII. The mushroom
- VIII. Evaluation test
- IX. Project brief

I Interviews

A

Telephone Interview: Dordrecht, Mr P. 't Lam from Plus supermarkets. Held on 9 November 2018 at 15:00

- what is the biggest strength of your company?
The company has recently been rebuilt and the product range extended, with a focus on more fresh food. The biggest strength of the company is his employees he said. His employees make sure every shelf is stocked in time and questions of customers are answered. In his supermarket, he made a food court which adds an experience for the customer, again with the help of his employees he creates a unique experience.
- Did you rebuild the company on certain qualities of the market now?
The rebuild enabled him to rethink the formula of the company. The new supermarket is more focused on fresh products, this can be seen in the number of fruits and vegetables that are presented without a packaging. He said to me "if you been there you would know" because the supermarket almost looks like a market, with products presented without packaging and food courts. Customers asked for more fresh products and he wanted to deliver this to his customers.
- Have you seen developments in the sustainability of packagings of fruit and vegetables last years?
One of the developments in food and food packagings are packagings which are aimed at a single people's household, this is also to prevent waste and of course food spillage. Another development is simple healthy food, people want food that is healthy and quickly prepared. In packaging developments the bio-based plastic seals and bags are upcoming, but a disadvantage is how to communicate a bio-based packaging he said.
- Are you innovating in packaging yourself?
As a supermarket we do not innovate our self, the only thing he does is standing on the lookout for more green suppliers. He would like to have a supplier with even more green packagings or ways to deliver food without packagings.
- What is your reason to keep innovating within your company?
To create the best experience for the customers he always listens to the feedback they give him. The feedback they give him is that they do not want packagings.
- Do you often get feedback from your customers about sustainability?
He said people becoming aware of the amount of packaging that is used and that they think it's unnecessary. He explained that some fruit and vegetables are imported and that those food products need a packaging and/ or seal to extend the expiring

date, an example is a cucumber. If food expires and gets thrown away it has an even worse impact on the environment, then when the food is eaten.

- Are there certain qualities a packaging needs to comply to for you and your customers?
He wants more sustainable packagings for his customers. But communicating a biological product is difficult he said.
- Are there certain fruits and/ or vegetables which are sold most?
Cucumbers are popular and peppers. The peppers are mostly sold in a packaging of three.
- Do you have suggestions that can help me with my project?
In the food market, the cost price is very important if a product is just a little bit more expensive people may not buy it. So keep a close eye on the cost price.

B

Telephone Interview: The Haque, Managing partner Product- en Marktinnovatie Mr J. van Mil from Greenco. Held on 12 November 2018 at 14:00.

- Are you currently innovating in packaging yourself?
He said that lowering the carbon footprint of the packagings is very important. Most of their packagings are 100 % recyclable, but they do not look like they are because they are completely made of plastic. Currently, they are working on a plastic bag in which the tomatoes are packaged. One of the packaging that is 100 % recyclable is the tomato bucket, which does not look recyclable because it is sturdy and has thicker wall thickness than other packagings.
- What is your reason to keep innovating within your company?
People become more critical he said. They are aware of "the plastic soup" and becoming more critical on what they buy. People like to see what they buy, so packagings need to be transparent. He told me that bio-packagings have the impression of being more sustainable, but they can not be recycled in the current recycling process. Which means they are worse for the environment than other plastic packagings. He wants to be ahead of the market which means they have to keep innovating. He told me that they want to show with a sticker on the packagings that the packagings are 100 % recyclable but not all supermarkets want to show this already. In a way, they hold back innovation and clarity.
- what is the biggest strength of your company?
The biggest strength of his company is that they are constantly innovating. They want to make their packagings as sustainable as possible because they believe that

people will be even more critical in the future. Supermarkets want to have more sustainable packagings as well. He said that some supermarkets are more accepting in innovative solutions for packagings than others.

- Are there certain qualities a packaging needs to comply to for you and your customers?
The packaging needs to comply with all the food quality regulations. Other demands are:
 - Handy to pick up by the consumer in the supermarket
 - Have to keep the tomatoes together (you do not want the tomatoes to go everywhere)
 - Transparent (people like to see what they buy)
 - Handy for transport to the supermarket in crates
- Can you make an estimation of the produced and sold products on a yearly base?
This information will not be published outside the report.
He estimated a total of 40 million packagings made and sold.
- Do you have suggestions that can help me with designing a new sustainable packaging for the fresh fruit and vegetable sector?
Keep in mind the cost price, the food industry is a competitive industry.
He told me to stay away from bio-packagings because they can not be recycled. PLA is a resource made of biodegradable sugars and so can be disposed of by composting. Mr J. van Mill told me that the composting process of PLA packagings takes a lot of time and is not an efficient way of disposing of a packaging. The products are transported from the Greenco to the supermarket in plastic crates, in these crates the tomatoes packagings are stacked in rows of two.
One suggestion what I should investigate is how to communicate that a product is biological and that a packaging is sustainable.
A packaging which is 100 % recyclable is an air pack packaging.
Greenco is now reintroducing the plastic bag for tomatoes. What I asked Mr J. van Mill was if that will create problems with transport to the supermarket and with transport from the supermarket to the home of the consumer. The tomatoes are more likely to be crushed in a bag. He responded that people need to be careful as they are already with other products like soft fruits, so why not with tomatoes.

C

Email: The Hague, Sales Director Oerlemans Packaging BV Mr M. Bos. Email responded on 10 November 2018 at 20:44.

Beste meneer/ mevrouw,

Mijn naam is Nathan en ik ben bezig met mijn master afstudeerproject. Ik studeer Industrieel Ontwerpen aan de Technische Universiteit in Delft en ik doe nu mijn afstudeerproject bij Kordaat Product Design. In mijn afstudeerproject ga ik een nieuwe duurzame verpakking ontwerpen voor de groente en fruit afdeling.

Op 26 oktober heb ik het Superfast Transparency event bijgewoond, waar ik meneer Verhagen zijn presentatie heb gezien. De presentatie was zeer interessant en ik hoop dat u mij verder kan helpen in mijn project. Ik zou u graag een paar vragen willen stellen om meer informatie te winnen. Het beantwoorden van de vragen kost maximaal 5 minuten van uw tijd. Hieronder heb ik de vragen voor u opgesteld. Zou u de vragen via de mail kunnen beantwoorden? Als u liever een telefonisch gesprek wilt hoor ik graag wanneer het u het beste uitkomt.

- Doet u zelf aan productontwikkeling of werkt u alleen in opdracht?

Zowel in opdracht van klanten die een probleem hebben of zelf een innovatie hebben bedacht.

Anderzijds heeft Oerlemans Packaging een uitvoerige R&D afdeling dus ook zelf bedenken en ontwikkelen we innovatieve folies en verpakkingen

- Wat is de grootste sterkte van uw bedrijf?

Innovatiegracht – veel kennis en knowhow in huis – levering en productie van een zeer breed producten pakket – Voedselveiligheid

- Voor mijn project wil ik graag de meeste voorkomende verpakkingen van de groente- en fruitsector in kaart brengen. Mijn vraag aan u is, of u gegevens heeft van de meeste voorkomende verpakkingen. Met name over het gewicht en de gebruikte materialen.

Wij leveren heel veel verschillende verpakkingen. Verpakkingen worden voor iedere klant op maat gemaakt qua formaat / dikte / uitstraling / bedrukking en materiaal.

Verpakkingen:

- HDPE kratzakken
- LDPE slazakken
- HDPE fruitverpakkingen voor op de winkelvloer in de supermarkt
- Allerlei vormen van groente en fruit verpakkingen : appel / wortel verpakkingen etc
- LDPE kistafdelevelle

- Heeft u eisen waaraan een groente- en fruitverpakking volgens uw visie minimaal aan moet voldoen?

- Moet functioneel zijn

- Moet het te verpakken product beschermen.
- Zakken moeten voldoen aan alle regels qua voedselveiligheid
- Duurzaamheid : zorg dat de verpakking na gebruik perfect te recyclen is

- Heeft u nog tips voor mij die mij kunnen helpen bij het ontwerpen van een nieuwe sustainable verpakking?

- [Zie bijgaand \(interne tekst\) inhoud over ontwikkeling van duurzame verpakkingen](#)

Alle informatie wordt vertrouwelijk behandeld en zal niet gedeeld worden met derden. Ik hoor graag van u. Als u tijd heeft en interesse in dit project zou ik graag een paar minuutjes met u een telefonisch gesprek willen voeren.

Alvast bedankt.

Met vriendelijke groet,

Nathan Blaak

D

Email: The Haque, The Greenery BV Mr A. Koot. Email responded on 12 November 2018 at 17:55.

Nathan,

Onderstaand de antwoorden;

- Bent u bezig met innovatie op het gebied van verpakkingen?
Ja met regelmaat
- Wat is de voornaamste drijfveer om te innoveren met betrekking tot duurzame verpakkingen?
Terugdringen CO2 footprint op basis van onze eigen duurzaamheidsdoelstellingen
- Wat is de grootste sterkte van uw bedrijf?
Dé leverancier van verse groenten en fruit middels een retail strategies
- Zijn er logistieke eisen waaraan een verpakking van groente en fruit aan moet voldoen?

Ja, voldoende bescherming, verlenging houdbaarheid, voldoende presentatie mogelijkheden en gemak voor consument

- Kunt u een schatting maken van de omgezette aantallen van u producten op de groente- en fruitafdeling op jaarbasis? Deze gegevens zullen niet gepubliceerd worden.
Ongeveer 60 miljoen omverpakking per jaar die een waarde van 1,2 mld Euro vertegenwoordigen.
- Heeft u nog tips voor mij die mij kunnen helpen bij het ontwerpen van een nieuwe sustainable verpakking?
Contact zoeken met het KIDV in Den Haag

Met vriendelijke groet,

The Greenery BV
Arno Koot

E

Telephone interview: Dordrecht, Consultancy manager Renewi Mrs K. Meulenbroeks. Held on 20 November 2018 at 16:30.

In the telephone interview with Mrs K. Meulenbroeks I received information which was new to me and also some information that confirmed some of my thoughts.

- Do you have demands for used materials or material combinations with I should take into account in the design of a new sustainable packaging?

Lots of packagings are made of multiple materials which is difficult to separate. For the recycling process the different materials need to be separated. If a packaging is made of multiple materials it is likely that it is not recycled, for example laminated bags of chips and laminated milk packagings cannot be recycled and are incinerated. To make sure a packaging is recycled, it is best to make it of one material. Most consumers do not see the difference between different kind of plastics and so not how to sort it properly. They have machines to sort plastics into the different kinds of plastics, but still not everything is sorted. When packagings have cardboard and plastic which is not separated at the consumers, it is likely that it all ends up in the incinerator.

When a plastic is red it can not be turned into a white plastic after recycling only into black plastic. This plastic has quality loss and will most likely end up in another kind of product, like for example a container or plastic roadblocks. Transparent foil which has a purity of 98% can be recycled into transparent foil again, this is also possible for other kinds of plastics. A price tag from for example a supermarket can influence the purity of the material. The white paper can be recycled into white paper, but if a paper is totally printed with colours, like for example magazines then it can never be recycled into white paper again.

- Waste separation by the consumer is not always done as intended by a disposal company, do you have thoughts about this how it can improve this with a new packaging solution?

Make packagings from one plastic or when from multiple materials, make it more clear for the consumer.

- Do you have numbers about how much packaging waste is disposed by your company last year? and how much waste is recycled last year?

Check "afvalfondsverpakkingen" for numbers about waste disposal.

Packaging companies have to pay a packaging fee because for companies it is not paid for by the government. Waste of companies ends up in the incinerator.

- Can recycled materials find their way back into food packaging?

We do mechanical recycling, which cuts the plastics into small species and separates it through containers with solvents with different densities. The plastic comes in contact with plastics from all kinds of products so can be contaminated. Because of this plastics cannot be reused into the food packaging industry. PET is the only material with a separate recycling flow and can be reused as food packaging. An innovation is chemical recycling in which the materials are separated on a molecule

level and so you remain with new materials. With this innovation more plastics can find their way back into the food packaging industry.

Mrs K. Meulenbroeks told me about a project with AkzoNobel in which plastics are recycled into oils and a certain material that can be used into paints.

F

E-mail: Dordrecht, Packaging specialist KIDV Ms C. Ouweland. Held on 10 Januari 2019.

Beste Nathan Blaak,

Mijn collega, Karen, heeft mij jou mail door gestuurd.

Ik heb namelijk voor mijn eigen afstuderen ook onderzoek gedaan naar het iconische blauwe champignonbakje.

Hoewel ik op dit moment niet mijn hele onderzoek mag delen kan ik wel wat opheldering bieden op jou vragen.

Materiaal:

Het huidige champignonbakje wordt bijna uitsluitend gemaakt van PS.

De reden hier voor is omdat PS een helder, slagvast en licht materiaal is met een lage smelttemperatuur.

Dit betekent dat het goed te thermovormen is, de deksel mooi helder transparant is en goed kan worden vast geseald.

Vorm:

- Het bakje zoals wij deze nu kennen is ontwikkeld in de jaren 90. De reden voor het nieuwe bakje was het verbod op rekfolies. De deksel moest het rekfolie vervangen.
- Het dekseltje zit vast met een aantal sealpunten omdat er werd geconstateerd dat het te gemakkelijk was om de verpakking te openen. Mensen zouden de bakjes openen, champignons er uit halen en los mee nemen.
- PS is door de hoge slagvastheid zeer dun te construeren. De ribben in de wanden zijn toegevoegd voor extra stevigheid. Hierdoor is het bakje te maken van zeer weinig materiaal. Aangezien plastic prijzen op gewicht worden bepaald heeft de hoeveelheid materiaal die nodig is per bakje directe invloed op de prijs.
- Het reliëf op de bodem is om condens op te vangen zodat deze niet in contact kan komen met het product, om bruine plekken te voorkomen.

Het dekseltje heeft kopruimte zodat de champignons niet tegen de deksel aan komen, ook weer om de kans op bruine plekken te minimaliseren.

- De afmetingen van de bakjes zijn geperfectioneerd zodat er zo min mogelijk lucht wordt vervoerd in de kratten, en deze efficiënt kunnen worden ingezet tijdens de pluk. De champignons worden bij het plukken namelijk meteen handmatig in de bakjes gedaan. De bakjes passen precies in de kratten, de kratten passen op hun beurt weer precies tussen de teeltbedden en het hele logistieke systeem is hier op geperfectioneerd.

Uitstraling:

De iconische blauwe kleur heeft een psychologische reden. Door het blauw van het bakje en de licht blauwe gloed van de deksel lijken de champignons witter.

Deze voorkeur voor een blauwe kleur zie je voornamelijk in Nederland terug. Bijvoorbeeld Duitse consumenten willen juist graag een volledig transparante verpakking zodat ze alle champignons beter kunnen bekijken op viezigheid en bruine plekken.

Informatie op de verpakkingen:

Witte champignons is een product waar weinig marge op zit, en waar de consument weinig aandacht aan besteedt in de supermarkt. Prijs is de leidende factor, niet het merk of de locatie in de supermarkt. Ik kon niet goed achterhalen waarom dit zo is. Sommige telers zetten hun naam wel op het etiket maar over het algemeen is het geheel zeer uniform. De ruimte voor innovatie is hierdoor niet groot, omdat innovatie een investering betekent en het voor de meeste telers niet haalbaar is dit te doen. In de supermarkten wordt er (bij de witte champignon) geen verschil gemaakt in verschillende kwaliteit champignons dus krijgen de telers ook niet meer geld als hun champignons van betere kwaliteit zijn. Een dure investering in een andere vorm of betere kwaliteit champignons levert te weinig op voor de telers zelf. Er wordt onderling ook vrijwel niet samengewerkt. Het is een zeer competitieve en conservatieve sector. Het paddenstoelen schap begint zich steeds meer te ontwikkelen, met meerdere soorten paddenstoelen en verschillende mixen, maar de witte champignon heeft hier tot op heden nog weinig profijt van.

Als laatste een tip, het heeft mij tijdens mijn onderzoek heel erg geholpen met zo veel mogelijk partijen te praten. Stuur een mail, bel of ga op bezoek. In mijn ervaring stonden de meeste bedrijven wel open om een aantal vragen van een afstudeerder te beantwoorden en om mee te denken met je onderzoek.

Hopelijk heb ik hiermee je vragen kunnen beantwoorden.
Nog heel veel succes met je afstuderen!

Met vriendelijke groet,
Caitlin Ouwehand

G

Telephonic interview: The Hague, Commercial director Verstappen advanced packaging. Ms M. Verstappen. Held on 20 November 2018 at 16:30.

Material:

Why is the packaging made of polystyrene?

The packaging is made from multiple materials, but the blue basket is made of Polystyrene. This material was chosen because of it a cheap material which is easy to thermoform into a deep shape like the basket. It is also a cheap solution to packaging as many mushrooms as possible.

Why is the stretch foil replaced by a lid back in the nineties?

Back then was a discussion about the share of PVC material in stretch foil, which is still an discussion. Then was suggested to come up with a different packaging without a stretch foil, although stretch foil is still used in the food packaging sector. The hard plastic lid also provided new possibilities, for example, the lid gave the possibility of stacking.

Do you know why the mushroom packaging has not gone through much innovation, it still looks the same?

Through the eyes of the consumer not much have changed to the packaging, but she thinks that it is a well-considered concept from back then. You also have to be in the possibility to make changes, this product is highly competitive in costs. If the consumer is not willing to pay more it is difficult to make changes without changing the costs.

Is the current mushroom packaging recyclable?

The packaging is recyclable if all the other stakeholders use and dispose of it as intended. They produce the packaging as sustainable as possible, they use recycled as virgin materials. She would like to do more with sustainability but the help of the government and the recycling businesses are needed then as well. Recycling also starts at the consumer. When you are looking at sustainability, the CO2 impact cannot be forgotten as well as the transport.

The materials they use in the production can have multiple life cycles.

Shape:

Why does the mushroom packaging have a square shape?

This is due to the volume of mushrooms which it needs to packaging and due to logistic reasons. The packaging is adjusted to the crate, which is used during transport. Also, the mushrooms grow inside the packaging, this packaging also facilitates this.

Is this packaging designed for a special production or sorting installation?

No, the packaging only fits in the crate for transport.

Why does the packaging have a structure on the sides as on the bottom of the packaging?
Stability and strength, producing a packaging with less material which is more sustainable. It needs to be designed for multiple processes. The packaging needs to be universal in a way that it can fulfill multiple purposes.

H

The structure at the bottom is there to catch moist and to protect the mushrooms from forces from outside, is this true?

This is true, these are purposes of the packaging.

Appearance:

Why is the packaging blue?

It has something to do with presentation, the mushrooms are not seen as the most important vegetable, so most of the time it is placed in the corner of a shelf of a supermarket. The colour of the packaging makes it stand out more, especially when it is placed in a corner. The blue colour also makes the white mushrooms appear more white.

Is a blue coloured packaging an association with mushrooms for consumers?

She thinks that it has created a recognisable product for the consumer. If you change the packaging it can result in a decrease in revenue, which is not what the packaging company wants and what the supermarket wants.

Why is there little information presented on the packaging?

She can not tell because this is done by other stakeholders.

Do you have additional tips which could help in this project?

Look at other stakeholders as well, there are a lot of demands from other stakeholders which limit innovation.

Procedure

To gather the information email contact was made with Ms C. Ouwehand, who is packaging specialist at the KIDV (Kennisinstituut Duurzaam Verpakken). Also, a telephonic interview was performed with Ms M. Verstappen, who is the commercial director at Verstappen Advanced Packaging.

The email interview was a structured interview, and the telephonic interview was a semi structured interview.

In appendix I F, the complete email from the KIDV is presented. In appendix I G, the paraphrased telephonic interview with Verstappen Advanced Packaging is presented. The answers are summarized per questions.

Results

- Why is the packaging made of polystyrene?

The material is cheap, clear, impact resistant, light weight and it has a low melting temperature (KIDV). The material is also relatively easy thermoformed in a deep shape like the mushroom packaging (Verstappen Advanced Packaging).

- Why is the stretch foil replaced by a hard plastic lid in the nineties?

In the nineties a prohibition came on the use of Polyvinylchloride stretch foils, which forced the need for a different kind of lid (KIDV)(Verstappen advanced packaging). The developed solid lid enabled stacking (Verstappen advanced packaging).

- What are the design reasons behind the shape of the packaging?

According to the KIDV, the lid is sealed to prevent people from taking mushrooms out of the packaging inside the store. The structure on the bottom is to catch moist, and to prevent the mushrooms from contact with the moist. This to prevent brown spots. The lid is extra high to prevent contact of the mushroom with the lid, also to prevent brown spots.

According to Verstappen advanced packaging, the square shape is due to logistic reasons and the volume of mushrooms it needs to package. The structure on the sides of the packaging are to save material, which saves costs and benefits sustainability. This was also named by the KIDV. The bottom structure is there to catch moist, but also to protect the mushrooms from mechanical damage.

- Is the packaging designed for a specific process or machine?

According to the KIDV, the packaging is designed to exactly fit inside the crates. The crates are designed to fit between the cultivation beds. The whole logistic system is optimised to the blue mushroom container.

- Why is the colour of the packaging blue?

According to the KIDV, the blue colour of the basket and the light blue glow of the lid, make the mushrooms appear more white. The preference for a blue mushroom packaging is mostly in the Netherlands, in Germany they prefer a transparent packaging.

The blue colour also has a presentational function. Mushrooms are often placed in the corner of a shelf and the blue coloured packaging makes them stand out more (Verstappen advanced packaging).

- Is the blue coloured packaging an association for mushrooms?

According to Verstappen advanced packaging, the blue packaging has created a recognisable product for the consumer.

- Why is there little information on the packaging?

According to the KIDV, the white mushroom is a vegetable with low margins. Some growers do put their name on the packaging, but most packaging are universal. There is no difference in quality of the mushrooms, also because of the price. According to Verstappen advanced packaging, the information is put on the packaging by other stakeholders than the packaging factory.

In figure 16, a visual summary of the results of the interviews is illustrated.

Conclusion

To conclude, the design of the blue mushroom container is functional design. The packaging features protect the mushrooms and extend the shelf life. The packaging has structures on the side as on the bottom, which is to protect the mushrooms and to save material. The design of the mushroom packaging is made to make pre-packaged mushrooms an efficient product throughout its life cycle. According to the interviewees, the mushroom packaging is blue because the Dutch people prefer blue packaging, while in Germany a transparent packaging is preferred. The blue colour makes the mushrooms appear more white. An insight is, that there is no difference made between the quality of the mushrooms, because of margins in price. An interesting question could be if the mushrooms become more popular if there is a separation in quality.

Discussion

In chapter “4.6 Benchmarking mushroom packaging” was found that mushroom packaging are sold in multiple colours. Comparing packaging from chapter “4.1 Packaging market” and chapter “4.6 Benchmarking mushroom packaging”, the observation is that more packaging are transparent or have a different colour than blue. Only one packaging was found with a blue colour. This could mean that the preference for the colour blue has shifted to a transparent or different coloured packaging. The reason for a transparent packaging could be that the consumers like to see the food inside the packaging before buying it. According to the interviewees the mushroom packaging is adapted to the life cycle of the mushroom, but if the packaging has not changed in shape over the years, it raises the question if it is still the most efficient way of packaging mushrooms. In a reusable packaging solution, pre-packaging could be a thing of the past. By pre-packaging mushrooms air is trapped inside the packaging, which is less efficient in transport.

The interviews were conducted about the blue mushroom packaging, which is an older packaging. Due to time limit only two interviews were performed about one packaging, to gather more insights interviews could have been conducted about other mushroom packaging.

II Consumer interviews

A Lucien

Interview Pilot: The Hague. Gender: Male Age: 24. Held on 5 December 2018.

General questions

- *Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)*

He thinks a little bit about sustainability when doing groceries. He never buys the most basic cheap product, like for example he never buys bloated chicken. But he does not look at packaging materials if they are sustainable. He buys the products which are most convenient, pre-packaged or not.

- *Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)*

More hygienic to packaging the food. Against expiration. A predetermined volume or amount of food.



- *How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)*

He will not separate this packaging, just throws it away completely in the residual waste bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)*

- Netting of the mandarins, because he has difficulty to rip the netting open.
- Champignon basket packaging, because it is not resealable.
- Grapes basket packaging, because they are relatively big and difficult to stack something on top of it when doing groceries. This because of the shape of the basket and the lid.
- Fresh food packagings to make a complete dish, these are packaged in a cardboard box and a plastic bag and some of the vegetables inside are packagings as well in plastic. In total, **this makes a packaging with a lot of plastic and paper**, just for one dish.
- Small tomatoes which are packed in a cardboard box or tray, these have to be taken out of the packaging to wash them, because there are no holes in the packagings to let the water escape when keeping the tomatoes in the packaging when washing them.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

Yes

- *What do you think of the appearance of this packaging? (Shape,color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

He finds it annoying that the packaging is not resealable when opened. The plastic used creates an irritating noise, a crackling noise. He finds the colour ugly and asks me if I know why it is blue. He does know that the green plastic basket is a packaging with chestnut mushrooms. Maybe use a more nature like colour, like brown or green. The packaging has a ribbing structure on the side, which he finds ugly and unnecessary.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

No, because it is plastic. The thin plastic used in the mushroom packaging is an association of an unsustainable packaging for him.

- *Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)*

The fact that the packaging is not resealable.

- *What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

He puts the mushrooms with the blue basket in the fridge with the lid of the packaging upside down on top of the packaging.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

He always uses a plastic basket to put his groceries in. He most of the time puts the mushrooms in first at the bottom of the basket and only stacks light groceries on top. He expects from the packaging that he can stack something light on top of it.



PS

- *Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)*

He thinks it has something to do with recycling and he expects to find it on a packaging.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

He knew you can lay the lid on top of the plastic basket upside down.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

- If he used the mushrooms the same day he leaves the mushrooms with packaging on the kitchen counter.

- He does not lay the waste of the mushrooms and another vegetable residual in the packaging when cooking or making a dish.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- He thinks the amount of mushrooms is too big for most of the consumers, think of making smaller portions.

- Making it better resealable.

- Making it look more natural with colours and shape.

- Using more sturdy plastic for stacking purposes.

B Hessel

Interview: The Hague. Gender: Male Age: 25. Held on 5 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

He does think about sustainability, but only about if the food itself. He wants his food to be sustainable and produced in a more animal-friendly manner. The fruits and vegetables he buys need to be biological and have a quality mark. If he has to choose between a prepackaged fruit or vegetable and a fruit or vegetable which is not packaged, he will choose for an unpackaged fruit or vegetable. Because it is cheaper and then he thinks the packaging is unnecessary.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

A predetermined volume or amount of food. Against expiration.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

He does separate the packaging. The plastic bag with sticker into a special plastic collection bag and the cardboard tray in the paper bin.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

The plastic bag does he find most convenient because it is made of one material and it can be compressed before throwing it into the bin. He could not think of another packaging from the fresh fruit and vegetable section which he finds inconvenient.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

No, he does not like mushrooms. But he knows the packaging.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

He thinks it looks cheap. The blue colour does not fit in the fresh fruit and vegetable section of the supermarket, but he associates the blue coloured basket with a mushroom packaging. The blue plastic feels cheap, different than transparent plastics.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

It feels and looks cheap, this is why he does not think it is a sustainable packaging. He does not think it can be recycled, it would be better if it was made of paper or cardboard he said.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

No bad experience, because he almost never buys and uses this packaging.

- What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

He does not know if the mushrooms dry up quickly, otherwise, he would put them in the fridge without the lid on top of the blue plastic basket.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?

(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

He would treat them the same as bananas. He thinks the mushrooms are tender products, so he would try to keep them on top of his shopping basket. He does not think the packaging will provide much protection.



PS

- *Can you explain this sign to me? Where can I find this sign?*
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

He knows this sign and all the specifics about the sign and the number 6. He also knows it is stamped into every plastic packaging.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)
- He did not know that the lid can be turned upside down when storing the mushrooms in the packaging.
- The holes in the lid are for making sure fresh air can come into the packaging.
- The lid could be used as a tray when cooking he thought
- Protection of the mushrooms.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

He has never used this so he could not answer this question.

- *What do you like to improve to this packaging?*
(Wat zou u willen verbeteren aan deze verpakking?)
- Making the packaging more sturdy so you do not have to worry when transporting it to keep it on top of other products.
- The shape of the packaging is good for transport in boxes and in the shopping carts.
- The shape of the packaging is less convenient for the mushrooms. Looking at the shape of mushrooms, air gets trapped into the packaging because mushrooms are more rounded and the packaging is a square basket.

C Alex

Interview: The Hague. Gender: Man Age: 25. Held on 5 December 2018.

General questions

- *Are you actively thinking of sustainability when doing groceries at the supermarket?*
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

No. He would **only buy unpackaged fruits or vegetables** is he for example only needs one paprika. Sometimes he finds it irritating if one fruit or vegetable is packaged, but this would not hold him back from buying it.

- *Can you explain to me why certain fresh fruit and vegetables are packaged?*
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

Because it looks more pretty. More convenient for transport. Marketing. To put barcode stickers on.



- *How do you separate this packaging when disposing of it?*
(Hoe zou u deze verpakking scheiden bij het weggooien?)

The complete packaging into the residual waste bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

He finds no packaging inconvenient.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

No, because he does not like mushrooms.

- *What do you think of the appearance of this packaging? (Shape,color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

He thinks the packaging looks boring and ugly. The blue colour of the packaging is noticeable.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

He knows it is a plastic packaging and he thinks that plastics are not sustainable.

- *Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)*

No, because he never buys this packaging.

- *What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

He would store the mushrooms in the packaging with the lid on top in the fridge. If he only had 2 or 3 mushrooms left he would probably store them in a little plastic bag in the fridge.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

He will look after what he stacks on top, so only light products on top.



- *Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)*

He knows that it means something about how bad the plastic is for the environment or how difficult it is to recycle. He also knows that these signs are shown on every plastic packaging.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

You can use it as a lid. If you turn the lid around and use it to store plants in.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

Had no insights in this question.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- Put a sticker on the packaging on which is shows where the mushrooms are grown.

D Monica

Interview: Dordrecht. Gender: Female Age: 53. Held on 6 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

She does not think about sustainability when doing groceries.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

Against bruising and squashing. A certain amount of fruit and vegetables for a certain price, maybe a special offer.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

The cardboard in the paper and cardboard bin and the plastic in the residual waste container.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

The plastic box for tomatoes, when doing groceries it had happened multiple times that the lid pops off. When the lid popped off the tomatoes went through the shopping cart. The shaker packaging as the box has this problem. They do not close as they should.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, every week.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

Difficult to judge, because she is used to this packaging. The packaging is fine because it has been around for a lot of time. The colour blue with the transparent lid has become logical to be a packaging for mushrooms. She does not find the packaging visually striking or attractive.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

No, because this packaging is designed a long time ago and she does not think they have thought about sustainability back then.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

No.

- What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

She throws the mushrooms in the vegetable drawer without the packaging.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

She always tries to keep the packaging on top of other groceries, when it happens that something is stacked on top of it, she makes sure it is something light. At the cash register, she has a shopping bag which is only used to put fruit and vegetables in. Again putting the mushroom packaging on top. You want to keep the mushrooms white, when they are crushed they turn brown.



PS

- Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She had no idea what it was and where to find it.

- Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

You can reseal it by pushing the lid on the blue basket.

- Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

- The basket is not the most sturdy packaging, it could tear when putting it in the shopping cart or shopping bag.
- She puts the waste of vegetables and fruits temporarily in the blue basket and in the end, throws away the fruit and vegetable waste in a separate bin. The blue basket is thrown away in the residual waste bin.

- What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)

- The blue basket could be more sturdy.
- The colour is recognisable, she would not change it.

E Wapperon

Interview: Dordrecht. Gender: Man Age: 67. Held on 6 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

No. He does not do groceries anymore, but he used to prefer to buy fruit and vegetables without a packaging.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

To extend the expiration date. Hygiene, to prevent people from touching the fruits and vegetables and then putting it back.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

He would separate the cardboard and the plastic. The plastic he would throw in the residual waste bin and the cardboard in the paper and cardboard bin.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

He does not have a specific packaging, but the plastic baskets with a lid are difficult to open for him.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

Yes, he used to buy this packaging.

- *What do you think of the appearance of this packaging? (Shape,color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

The appearance of this packaging is fine to him. He does not care how the packaging looks.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

It is plastic so he thinks it is not sustainable or recyclable.

- *Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)*

No.

- *What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

He would store them in the fridge inside the mushroom packaging with the lid on top.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

He would put it on top of other groceries. When he places it at the bottom of the shopping cart or shopping bag, he would only stack light products on top of it.



PS

- *Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)*

He had no idea what the sign means or where the sign can be found.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

The holes in the lid are to let air in and out. To keep the mushrooms inside the packaging when it falls or when it is placed upside down. To give better abilities for stacking during transport, this was about the shape of the lid. He also mentioned that it protects the mushrooms from being crushed when something is placed on top of the packaging.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

Not relevant in the interview with this person.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- He would not change the square shape, because of transport efficiency. when using other shapes you would trap more air between packagings and the efficiency will be less.

F Eduard

Interview: Dordrecht. Gender: Man Age: 53. Held on 5 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

When buying groceries he thinks about sustainability. He does not like it when everything is packaged, he says that he does not want his whole counter to be full with plastic packagings when cooking. He says that some products are double packaged, in two plastics or in cardboard and plastic.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

to extend expiration and to sell certain portions or volumes.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

The cardboard he throws away in the paper bin. The plastic in a plastic bag especially for collecting and separating plastic waste from residual waste.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

He finds the peppers packaging inconvenient, because they are packed per three peppers and most of the time he only needs one. The packaging of this vegetable is made of plastic and cardboard, which he finds unnecessary. If it had no packaging it would be better. And if you have this packaging you cannot reseal it.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, almost every week.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

He does not like the look of the packaging, because it does not look like something that would contain fresh products. The colour is recognisable as mushrooms packaging, because it has been around for many years.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

He thinks that it is not a sustainable packaging, because of the colour. He could not name another reason.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

The lid, when taken off the blue basket, cannot be clicked onto it again. So he tears of the lid and throws it away.

- What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

He would leave them in the blue basket and put them like that in the fridge. The lid he throws away right after he tore it from the basket.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

He places the mushrooms with the packaging in the front of the shopping cart and on top of other products. In a shopping bag he makes sure it is on top as well.



PS

- Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

He has seen the sign on packagings, but he does not know what it means. Never paid special attention to it.

- Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

To keep the mushrooms inside the packaging during transport. To stack on top of each other in the crates during transport. Also to keep the mushrooms fresh.

- Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

He only used the packaging to store mushrooms and for transport. After use he throws away the lid directly and the basket is only used for storage of fresh mushrooms, not to store waste.

- What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)
- Make a packaging that can decrease in size, to save space in the bin.
- The blue colour is associated with mushrooms.
- Make a lid that stays on better.

G Anita

Interview: Dordrecht. Gender: Female Age: 50. Held on 5 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

She hates if everything is packaged, and so she tries to avoid a lot of packaged products. Still, when cooking a lot of packagings are on the counter. She does not look at materials, just if packaged or not.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

She thinks of hygienic reasons.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

She sorts the plastics from residual waste and cardboard she throws away into the cardboard bin.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

The foil around the cucumber is difficult to take off. She also found the netting in which mandarins are packaged annoying, because she has to take scissors to open the netting.

One packaging which she finds bad is the packaging of bread which is made of two materials. This is a bag which is made of a front of plastic and a back of paper material. She did not know how to sort this packaging when throwing it away.

which is

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, every week.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

She said it has become a habit because she knows that this packaging is for mushrooms. She does not think it is a beautiful packaging, and it is not handy in usage. She always tries to put the lid back on the packaging when storing mushrooms, but it cannot be clicked onto the blue basket again, she finds this annoying. It is good that the lid is transparent, but you cannot see the mushrooms at the bottom of the packaging.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

She thinks it is an unsustainable packaging. The blue colour does not look sustainable she thinks, but she could not explain it more elaborated.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

The lid cannot be clicked onto the blue basket again. What she does is loosely lay the lid on top, always a bit irritated because it does not click shut.

- What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

She either throws the mushrooms without packaging in the vegetable drawer, or she stores them in the packaging with the lid loosely on top of the blue basket.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?

(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

She expects from the packaging that something light can be stacked on top, so she lays the packaging in the cart most of the time in the front and only stacks light products on top. The same story with the shopping bag.



PS

- Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She knows it was an recycling mark, but she could not tell what the number means. She has seen it is stamped into plastic packaging.

- Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

She thinks to keep the mushrooms fresh and in one piece, to keep them from turning brown by being crushed. The packaging seems good to stack when being transported.

- Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

She does not use this packaging for waste, only to store mushrooms and when the packaging is empty she throws it away in the bin for plastics.

- What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)

- The lid should be made so it can be clicked on top of the blue basket after usage.
- Maybe a complete transparent basket so you can see the mushrooms at the bottom as well.

H Manon

Interview: Dordrecht. Gender: Female Age: 28. Held on 5 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

She does not want to throw away food, so she rather buys unpackaged than a prepackaged amount of food. Especially when she is alone, it is better for her to buy unpackaged fruits and vegetables for example, tomatoes if she only needs two she rather buys them unpackaged, then having to buy six of them prepackaged.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

She thinks because of marketing. When you buy for example bananas you want the sticker of a brand on it. The same with other products, branding is important. Also against the expiration of the fruit and vegetables, she named the cucumber as an example. She knew that the expiration date is extended with the foil around it, although she finds this packaging annoying.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

She separates the plastic and cardboard when throwing it away.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

The cucumber foil, this is a packaging which is difficult to take off. The foil is too tightly wrapped around the cucumber.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, every week.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

She says it is a traditional packaging, she knows it from since she was young. She explains that the blue basket is packaged with white mushrooms and the green packaging with chestnut mushrooms. She does not find the blue colour ugly but also not pretty. It is an outstanding colour in the fruit and vegetable section of the supermarket.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

She says that the plastic is thin and not sturdy, which does not seem sustainable to her. Also, she thinks it is made of multiple materials, which can not be good as well. She says that she remembers something about coloured plastic being less sustainable.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

The lid, after taken off once she throws it away. She knows from experience that the lid cannot be clicked onto the blue basket after taken off once.

- What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

The lid she would throw away and put a little plastic bag around the blue basket with mushrooms inside it. Sometimes she also wraps the blue basket in tinfoil. She does wrap the packaging again because she shares her fridge with others. Otherwise, she would not wrap the packaging before putting it into the fridge after usage.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?

(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

She makes sure it is not placed at the bottom of her shopping bag, but sometimes it happens that lays somewhere in the middle of the bag. The products on top are light and the packaging can cope with light products on top.



PS

- *Can you explain this sign to me? Where can I find this sign?*
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She knows it is a recycling sign, but she could not tell me more about it. She explained that towns in the Netherlands have different rules about sorting waste.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

To protect the mushrooms and to stack efficiently when transported.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

She sometimes used the blue basket to temporarily store waste when cooking, but she throws the green waste away in the designated bin and the plastic packaging in the plastic bin.

- *What do you like to improve to this packaging?*
(Wat zou u willen verbeteren aan deze verpakking?)

- A lid that can be resealed or be closed shut again.
- Make a packaging that can be compressed before throwing it into the bin.

I Sander

Interview: Dordrecht. Gender: Male Age: 25. Held on 8 December 2018.

General questions

- *Are you actively thinking of sustainability when doing groceries at the supermarket?*
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

No, he does not think about sustainability. Most of the time he buys pre packaged fruits and vegetables, because of the prepackaged volume.

- *Can you explain to me why certain fresh fruit and vegetables are packaged?*
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

To keep the fruit and vegetables fresh and clean. He also thinks a prepackaged volume of food is a marketing strategy, people are more likely to buy more with prepackaged food.



- *How do you separate this packaging when disposing of it?*
(Hoe zou u deze verpakking scheiden bij het weggooien?)

He will not separate the packaging. He would throw the complete packaging in the residual waste bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

He does not have a packaging in mind which he finds inconvenient. He says that most packagings are made from sturdy plastics which works as they should work.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

He knows the packaging but does not buy it himself.

- *What do you think of the appearance of this packaging? (Shape,color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

When he was holding the packaging he did not find the packaging as sturdy as he thought it was. He says that he thinks that if you drop the packaging that the lid would pop open and that the mushrooms would go over the floor. He finds the colour pretty, he says that it stands out from other packagings from the fruit and vegetable department in the supermarket.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

He assumes that coloured plastics are more difficult to recycle and that when pigments are added to the used plastics, that they are less sustainable. He adds that this is an assumption of him.

- *Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)*

He never used this packaging when cooking, but he thinks the packaging is not sturdy enough. He is afraid the lid pops off when the packaging is dropped.

- *What do you do with the packaging if you only use a number of mushrooms and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

Depends on how much mushrooms are left, if there are only a few he would probably put them in a little plastic bag. If half of the mushrooms are left he would remove the lid and wrap the blue plastic basket in tinfoil, against expiration.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

He thinks the packaging of the mushrooms is not sturdy enough to put at the bottom of the shopping card, so he would keep the packaging at the top of the groceries.



- *Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)*

He thinks it is about recycling, because of the arrows. The number stands for a certain ranking, but he does not know if 6 is good or bad. He does not know what PS means. He has seen this sign before on a packaging. The recycling logo he recognises, but not the sign with the number and PS incorporated with the recycling logo.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

The closing of the packaging, so keeping the mushrooms inside the packaging. He says It would not be handy if the packaging had no lid, also with stacking something on top. The holes in the lid are for keeping the mushrooms fresh he thinks. He did not know you can turn the lid around and put on the blue basket upside down.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

When cooking, it sometimes happens that waste of the mushrooms and other vegetables are temporarily stored inside the blue basket or an empty milk packaging. After cooking the green waste is separated from the packaging and thrown away in separate bins. Sometimes the packaging is thrown away directly without being used as a bin.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- The packaging could be more sturdy, the packaging feels weak.
- There could be more information on the packaging about the mushrooms and about the packaging.

J Geesje

Interview: Dordrecht. Gender: Female Age: 48. Held on 8 December 2018.

General questions

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

No, she is not actively thinking about sustainability when doing groceries. When she has the choice between a prepackaged and unpackaged fruit or vegetable, she prefers unpackaged. Prepackaged fruit and or vegetables have detergent volumes, which is not always handy for her when she for example only need one piece of fruit or vegetable.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

Hygiene, to keep the fruit and vegetables clean. Some products come from abroad, she says that these products need packaging to keep them fresh.



- How do you separate this packaging when disposing of it?
(Hoe zou u deze verpakking scheiden bij het weggooien?)

She would separate the materials. The plastic in the plastic disposal bag and cardboard in the paper bin.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

She told me that she finds the grapes plastic packaging the most inconvenient. The packaging is not sturdy enough to protect the fruit when other products are stacked on top of it. The shape of the packaging is also difficult to stack and the packaging tears when pressure is applied to it, and then you get sharp edges.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?



- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, almost every week.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

She thinks the packaging is alright because it is been like this for a long time. The colour blue in combination with the shape of this packaging is an association with white mushrooms to her. The shape of the packaging is handy to put in the shopping bag she said.

- Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)

No, she thinks not because the packaging is made of plastic. When she thinks of sustainable packaging she thinks of cardboard materials.

- Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

No.

- What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

She would store them in the fridge inside the packaging with the lid on top because the lid has holes in it so is made to keep the mushrooms fresh. She puts the lid upright on the blue basket.

- When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

She places the mushrooms in the front of the shopping cart. At the front of the shopping cart is a separate part in which she puts all fruit and vegetable products. If the shopping cart does not have that part she makes sure the mushroom packaging stays on top of the other

groceries. In the shopping bag she makes sure the mushroom packaging stays on top as well.



- Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She knows it is a recycling sign because of the arrows arranged in a triangle. She could not tell what the number six represents. She did know that this sign can be found on the packaging.

- Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

To protect the mushrooms inside. To prevent mushrooms from falling out of the basket when the packaging falls on its side. The holes in the lid are to make sure fresh air can reach the mushrooms. The lid provides the possibility to stack the packaging. She did not know that the lid of the mushroom packaging could be turned upside down and laid into the blue basket.

- Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggoien?)

When cooking she only takes the fresh mushrooms out of the packaging and does not throw any green waste into the packaging. When all mushrooms are out of the packaging she throws it directly into the plastic bag for plastic waste. Vegetable waste she puts in an old newspaper and then throws that completely in the garden and green waste bin.

- What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)

- The thing she would change is the colour, she would make the packaging transparent. When the packaging is transparent you can see the mushrooms at the bottom as well she said.

K Zus Jens

Interview: The Hague. Gender: Female Age: 32. Held on 10 December 2018.

- Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

When she is doing groceries she makes sure that she has **at least packagings as possible.**

The unpackaged fruit and vegetables you take and put in a plastic bag. She puts multiple kinds of fruit and vegetables together in one plastic bag, instead of taking multiple packagings.

- Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

To make sure the fruits and vegetables get to their destination unharmed, especially during transport the food gets bruised sometimes. packagings can also be used to bundle food products together. She adds that some food is unnecessarily packaged.

- How do you separate this packaging when disposing of it?

She does not separate plastics at home. All plastic waste is thrown in the residual waste bin. She will separate this packaging, and throw the cardboard in the paper bin and the plastic in the residual waste bin.

- Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

She tells that some tomatoes and avocados are packaged in a cardboard basket/ tray with a plastic bag around it, she thinks this is unnecessary, only a plastic bag or a cardboard basket or tray is enough. They should packaging these vegetables better and more efficient. Avocados can be bought without a packaging, so the current packaging is not against keeping the avocado from damaging during transport.

Small fruits like strawberries and raspberries are packaged in a sturdy plastic basket with a resealable foil on top. When opened once, the seal of the foil is not strong enough to hold weight from products that are stacked on top, which means you can not stack products on top of it in, for example, the fridge.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, sometimes.

- What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

The packaging is recognisable. The shape and colour are outstanding from other products at the fruit and vegetable department. When she buys mushrooms she looks through the transparent lid to see the size of the mushrooms. She likes that the packaging has a transparent lid.

- *Do you think it is a sustainable packaging? and why?*
(Denkt u dat het een duurzame verpakking is? en waarom?)

She thinks that this packaging can be recycled because it looks like clean plastic, there are no printed visuals on the packaging. The sticker on top cannot be recycled and can be unhandy for a recycling company to remove.

- *Have you ever had a bad experience with this packaging?*
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

She says, that she is always annoyed with the lid because it cannot be closed shut after opened once. In the vegetable drawer, the lid comes off the blue basket and then the mushrooms go through the vegetable drawer.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?*
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

She leaves the mushrooms in the packaging with the lid on top in the upright position. Then she lays the packaging in the vegetable drawer and tries to push the lid of the packaging on top of the blue basket hoping it clicks shut, which it never does.

When she opens the packaging she tries to open it as a flip-open lid, with the intention to keep the lid attached to the blue basket, but unfortunately, it fails every time.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?*
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

The packaging keeps the mushroom together well. It also protects the mushrooms from pressure from the outside. When she is doing groceries she makes sure the packaging is only stacked with light products, sometimes she even keeps the packaging on top. She adds that she does not find it a problem that you can not stack heavy products on top of it. It would be unnecessary if the packaging can withstand high forces.

- *Can you explain this sign to me? Where can I find this sign?*
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She thinks it is a recycle mark, but she did not know more about it. She did not know where to find this mark.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

The holes in the lid of the packaging are there to make sure fresh air can reach the mushrooms and to make sure moist can escape. The transparent lid is to give the possibility

to let the customer see the mushrooms while they are in the packaging. She does not get why they designed the packaging with a lid that can only be fastened once. She did not know you can place the lid upside down in the blue basket.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggoien?)

When she has used all the mushrooms, the packaging is used as a temporarily green waste bin. After cooking she throws the vegetable waste in the garden and green waste bin, and the plastic mushroom basket in the residual waste bin. The lid of the plastic is also thrown away in the residual waste bin.

- *What do you like to improve to this packaging?*
(Wat zou u willen verbeteren aan deze verpakking?)

- If the packaging can be made more sustainable, make it more sustainable.

- A lid that can be fastened multiple times.

- An idea could be that people can take the mushrooms themselves and the packaging is adapted to this formula.

L Ans

Interview: Dordrecht. Gender: Female Age: 59. Held on 10 December 2018.

- *Are you actively thinking of sustainability when doing groceries at the supermarket?*
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

Before doing groceries she makes a list of what she needs to buy, but also of products that are on sale. In the supermarket, she looks at the packagings and products and prefers to buy more sustainable products. If she has the choice between prepackaged and unpackaged products, **she prefers unpackaged.**

- *Can you explain to me why certain fresh fruit and vegetables are packaged?*
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

Hygienic reasons. Making the food products more attractive to consumers, for example, plastic packagings in combination with the lighting in the supermarket can make the products look more fresh and attractive.

- *How do you separate this packaging when disposing of it?*

She would separate the materials. The plastic she would put in the plastic bag for plastic waste and paper in the paper bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

She does not know a packaging of the fruit and vegetable sector which she does not like or has had a bad experience with. She told, that the plastic bags which you can take to lay

unpacked fruit and vegetables in are not preferred by her when there is a paper bag available as well. Her feeling says to go for a paper bag instead of a plastic one.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

Yes, almost every week.

- *What do you think of the appearance of this packaging? (Shape,color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

She likes that the packaging is made sturdy to protect the mushrooms inside. The colour of the packaging does not matter to her, because you have them also in a completely transparent basket, but that does not make the packaging more attractive to her. When taking mushrooms from the shelves she looks through the lid if the mushrooms are fresh and shiny. She likes that if there is a basket around a product that the basket is sturdy, otherwise it feels like a waste of material.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

No, she thinks not. The material feels thin and more as it could only be used once. The blue colour does not look sustainable.

- *Have you ever had a bad experience with this packaging?
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)*

She has sometimes troubles with opening the lid, it is fastened well on the blue basket.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

If she uses the mushrooms within a week she leaves the mushrooms in the basket with the lid upright, if she stores the mushrooms for more than a week she puts them in a small plastic bag and freezes them.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

She makes sure only light products are stacked on top of the mushroom packaging, or she makes sure the packaging stay on top of the groceries, it differs.

- *Can you explain this sign to me? Where can I find this sign?*

(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She recognises it, but she could not tell me what it is or where you can find this sign.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

Shield the mushrooms from influences and forces from above. The holes in the lid are to let fresh air reach the mushrooms, this keeps them fresh for a longer period of time she said. When she has a fully packed fridge, for example, when there is a birthday. She puts the lid upside down in the blue basket to have a smaller packaging.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

When she uses all the mushrooms in the packaging, she throws it away in the plastic bag for plastic waste after cooking. She does not use the packaging as a temporary waste bin.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- The opening of the packaging, she can imagine that people with less strength in their hands can have difficulties opening the lid.
- The sturdiness of the packaging is good and it protects the mushrooms well.
- The colour does not matter to her.

M Adrie

Interview: Dordrecht. Gender: Female Age: 59. Held on 10 December 2018.

- *Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)*

When she is doing groceries she pays attention to sustainable products. She tells that a lot of products in the supermarket are packed for no reason. When she has a choice between pre packaged and unpackaged fruits and vegetables, the choice will always go to **unpackaged fruits and vegetables.**

- *Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)*

She has been told that a packaging keeps the fruits and vegetables fresh for a longer period of time. She commented, that it is not always clear what should be stored in the fridge and what not. Wrongly stored food products can affect the expiration date of the food.

- *How do you separate this packaging when disposing of it?*

She would separate the materials. The plastic she puts in the plastic bag for plastic waste and the paper in the paper bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*

(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)

The vegetables which are vacuum sealed with a foil, this does not look fresh and attractive to her. She would rather buy unpacked vegetables. She also makes sure these vegetables lay on top of other groceries, she is afraid the vegetables get bruised.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- *Do you buy mushrooms in the blue basket sometimes?*
(Koopt u weleens champignons in het blauwe plastic bakje?)

Yes, almost every week.

- *What do you think of the appearance of this packaging? (Shape, color, material feeling)*
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)

She tells that there are also packagings in which the products lay beside each other, this packaging appears more to her. Also, the bottom mushrooms in the current packaging sometimes get bruised by the pressure of the mushrooms on top, this can not be seen through the lid of this packaging. The shape of the packaging may be more flat, which makes the mushrooms more appealing. She likes the blue colour of the basket because it is recognisable and stands out between other packagings.

- *Do you think it is a sustainable packaging? and why?*
(Denkt u dat het een duurzame verpakking is? en waarom?)

She thinks it is a sustainable packaging, because she has seen programs about plastic and recycling. She thinks this plastic can be recycled, Also because there are no visuals printed on the packaging, only a sticker.

- *Have you ever had a bad experience with this packaging?*
(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

It happened multiple times that the lid of the packaging popped open in the grocery bag during transport. The bag was filled with all kinds of products, but probably it opened by the pressure of the other products on the mushroom packaging. The packaging should be sealed better.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?*
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)

She would put the mushrooms in the vegetable drawer without the packaging. The packaging will be thrown away into the plastic waste bag.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?*

(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)

Most of the time this packaging lays on top of the other groceries. Sometimes it happens some light products are layed on top of the mushroom packaging.

- *Can you explain this sign to me? Where can I find this sign?*
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)

She thinks this sign can be found at the dairy products section. She has not seen this sign before, but this was an association she got when seeing this sign.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)

She can imagine if the mushroom packaging had no lid that the mushrooms went everywhere. The function of the lid is to keep the mushrooms in the packaging.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*
(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

When she uses all the mushroom she sometimes uses the lid as a tray to lay green waste onto before throwing it away in the waste bin. The blue basket always stays empty after using all the mushrooms, and is after emptied thrown away.

- *What do you like to improve to this packaging?*
(Wat zou u willen verbeteren aan deze verpakking?)

- A more flat packaging in which the mushrooms lay beside each other will also help against bruising of the mushrooms. So the mushrooms will stay fresh longer. The mushrooms are also better presented in this way.

- A packaging with a lid that seals better.

N Atie

Interview: Dordrecht. Gender: Female Age: 41. Held on 11 December 2018.

- *Are you actively thinking of sustainability when doing groceries at the supermarket?*
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)

She definitely thinks about sustainability when doing groceries. She prefers to take unpackaged fruits and vegetables, and she tries to avoid the plastic bag in which you can put these unpackaged fruits and vegetables. Some products need a bag to keep them together, but some definitely do not need to be packed. She does not buy a lot of prepackaged products, but if you take a plastic bag to packaging fresh fruits and vegetables then it does not really matter, because you packaging it yourself then.

- *Can you explain to me why certain fresh fruit and vegetables are packaged?*
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)

To keep food fresh for a longer period of time. Some products are imported, then a packaging keeps the food fresh and provides protection against influences from outside.

Also to provide the consumer with a certain portion or a certain volume of food at once, which is also easier for the consumer. A packaged fruit or vegetable could look more attractive to the consumer than an unpackaged fruit or vegetable. However, she finds it more attractive when fruit and vegetables are presented without a packaging.

- *How do you separate this packaging when disposing of it?*

She is very precise in sorting waste. The paper tray will go in the paper bin and the plastic bag in the plastic bag for plastic waste.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*
(*Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?*)

The most irritating packaged vegetable is the cucumber with the plastic seal around it. This seal is difficult to take off without damaging the cucumber itself. She has been told that it helps against the expiration of the cucumber, but still, she would like to see unpacked cucumbers.

A packaging which she does not understand is the bread packaging with a front of plastic and the back of the paper. **This packaging consists of two materials which are sealed together.** She does not know how to sort this packaging and so, throws the complete packaging in the residual waste bin. She likes the bread of that supermarket, but she annoys herself to this packaging.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- *Do you buy mushrooms in the blue basket sometimes?*
(*Koopt u weleens champignons in het blauwe plastic bakje?*)

Yes, every week.

- *What do you think of the appearance of this packaging? (Shape, color, material feeling)*
(*Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal*)

She does not like the look of the packaging, because of the square shape of it and the colour. The colour blue has become an association with mushrooms to her, but she does not necessarily like the colour for a fresh vegetable. The edges of the packaging should be more rounded and less sharp. She said that the material could be cardboard instead of plastic then it would appear more to her.

- *Do you think it is a sustainable packaging? and why?*
(*Denkt u dat het een duurzame verpakking is? en waarom?*)

She does not think it is a sustainable packaging because it is made of plastic. She thinks that this packaging contributes to the plastic soup.

- *Have you ever had a bad experience with this packaging?*
(*Heeft u ooit een slechte ervaring gehad met deze verpakking?*)

no.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?*
(*Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?*)

She would store the mushrooms in the packaging with the lid on top in the upright position. The complete product will go in the fridge. She tells that it is always a bit of a hassle to put the lid on top of the blue basket after it has been opened because it does not click onto it again. In the end, she just lays it on top.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?*
(*Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?*)

She thinks because it is made from plastic that it can withstand the pressure of other products that are stacked on top. She does not look where she puts the mushrooms in the shopping card. She adds that fruit and vegetables are always at the beginning of the supermarket so only fruit and vegetables are stacked on top of the mushroom packaging.

- *Can you explain this sign to me? Where can I find this sign?*
(*Kan u mij dit teken uitleggen? Waar is dit teken te vinden?*)

She recognises the sign but she does not know what it means or where she could find this sign.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(*Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?*)

Keeping the mushrooms fresh, against mold. The holes in the lid are to let air through. Protecting the mushrooms from bruising by keeping them protected from forces from outside, for example, during transport. She did not know that the lid can be put upside down into the blue basket to store mushrooms.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*
(*Kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?*)

During cooking she does not use the packaging as a waste bin, the packaging stays empty and is thrown away after cooking. The green waste goes directly into the garden and green waste bin.

- *What do you like to improve to this packaging?*
(*Wat zou u willen verbeteren aan deze verpakking?*)

- Making the packaging from a material that can easily be recycled.
- The design could be more attractive, but it will not affect her buying rate of mushrooms.

O Coert

Interview: Dordrecht. Gender: Female Age: 44. Held on 11 December 2018.

- *Are you actively thinking of sustainability when doing groceries at the supermarket?
(Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?)*

Yes he looks at sustainability in a way that he buys food that looks most fresh, these can be pre packaged or unpackaged. When he has the choice **he would rather buy unpackaged fruits and vegetables, but only if these look better than prepackaged products.**

- *Can you explain to me why certain fresh fruit and vegetables are packaged?
(Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?)*

Ease of transport and hygiene. To keep the fruit and vegetables clean during transport, but also in the supermarket.

- *How do you separate this packaging when disposing of it?*

He does not separate this packaging. He says that there is plastic around the cardboard and that he will probably throw it away completely in the residual waste bin.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?
(Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?)*

He has had with the packaging of blackberries that the lid popped open during transport, which is because the plastic is too thin or too weak.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- *Do you buy mushrooms in the blue basket sometimes?
(Koopt u weleens champignons in het blauwe plastic bakje?)*

Yes, every week.

- *What do you think of the appearance of this packaging? (Shape, color, material feeling)
(Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal)*

He has no problems with this packaging, because it is easy to stack and to take out of the shelves and your shopping bag. It is also a handy basket to store mushrooms. The only thing which is wrong is when you look at the packaging from a sustainable point of view, he does not think this packaging is sustainable. The blue colour he associates with a fresh product.

- *Do you think it is a sustainable packaging? and why?
(Denkt u dat het een duurzame verpakking is? en waarom?)*

No, because it is made of plastic.

- *Have you ever had a bad experience with this packaging?*

(Heeft u ooit een slechte ervaring gehad met deze verpakking?)

He has had no bad experience with this packaging.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?
(Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?)*

He would leave the remaining mushrooms in the packaging with the lid on top in the upright position. He stores it in the fridge.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?
(Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?)*

His experience with this packaging tells him that it is a sturdy packaging, so he does not look too much at where he puts this packaging. The packaging often sits at the bottom of the shopping card and the shopping bag.

- *Can you explain this sign to me? Where can I find this sign?
(Kan u mij dit teken uitleggen? Waar is dit teken te vinden?)*

He knows the mark tells something about the type of plastic that is used to make the packaging. It is also a recycling mark. He did not know more about this sign. The sign can be found on the packaging, it is stamped in the plastic.

- *Can you tell me the functions of the lid of the blue mushroom packaging?
(Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?)*

You can seal the lid to the blue basket to protect the mushrooms during transport. You can turn the lid around and put back in the blue basket, when storing mushrooms. You can throw away the packaging and use it as a sorting basket for waste.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?
(Kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)*

The packaging has a multiple functions he says, when he is cooking he uses the lid and the basket as a waste tray. All green waste he puts in the packaging and after cooking he throws away the green waste into the green bin.

- *What do you like to improve to this packaging?
(Wat zou u willen verbeteren aan deze verpakking?)*

- A problem is the volume which the packaging has in the bin. he would like to have a packaging that can decrease in size to save space.

P Brigitte

Interview: Dordrecht. Gender: Female Age: 46. Held on 12 December 2018.

- *Are you actively thinking of sustainability when doing groceries at the supermarket?*
(*Bent u actief bezig met duurzaamheid wanneer u boodschappen doet?*)

Before she goes to the grocery store she makes a list of what products she needs to buy and does not look at if a product is made in a sustainable way. She does not like it if all fruits and vegetables are packaged, she thinks some fruits and vegetables are unnecessarily packaged, like the seal around a cucumber. When she picks unpackaged fruits and vegetables she tries to avoid to take a bag to put them in, a sticker can also be placed onto the fruit or vegetable itself. The ideal situation for her would be if there was a greengrocer inside the supermarket who grabs the fruits and vegetables for you.

- *Can you explain to me why certain fresh fruit and vegetables are packaged?*
(*Kan u mij uitleggen waarom sommige verse groenten en fruit verpakt zijn?*)

The food stays fresh for a longer period of time. To avoid people from touching the fruits and vegetables in the supermarket. (hygienic reason)

- *How do you separate this packaging when disposing of it?*

She always separates the waste. The plastic of this packaging would go in the plastic bag for plastics and the cardboard in the paper bin. She tells that she has more plastic waste than residual waste.

- *Which packaging of the fresh fruit and packaging sector is most inconvenient for you? and why?*
(*Welke verpakking van de verse groente en fruit sector vindt u het meest onhandig of het slechts? En waarom?*)

Nut butter cheese is vacuum packaged in a plastic seal, but to take the seal off, you have to damage the cheese. Some products have too much packaging around them, sometimes the food product has two packagings around it.

Mushroom Basket (handing over the mushroom packaging) What can be improved to the blue mushroom packaging?

- *Do you buy mushrooms in the blue basket sometimes?*
(*Koopt u weleens champignons in het blauwe plastic bakje?*)

Yes, almost every week.

- *What do you think of the appearance of this packaging? (Shape, color, material feeling)*
(*Wat vindt u van het uiterlijk van deze verpakking? Vorm, kleur, gevoel van het materiaal*)

She says that she does not care about the appearance of a mushroom packaging, but she thinks it is important that the mushrooms are packaged. There must be a reason why they have a plastic basket as a packaging. She has an association with the shape of the packaging and mushrooms, but not with the colour. She likes a green basket more and she thinks that mushroom packagings in a green basket are biological. She would rather buy a

plastic packaging with a green colour than a blue colour, she does not like the blue colour. The colour does not hold her back from buying mushrooms. An improvement could be to make the mushrooms more visible inside the packaging from a distance, now you have to look through the lid.

Do you think it is a sustainable packaging? and why?

(*Denkt u dat het een duurzame verpakking is? en waarom?*)

Yes, because plastic can be recycled.

- *Have you ever had a bad experience with this packaging?*
(*Heeft u ooit een slechte ervaring gehad met deze verpakking?*)

No, not that she can think of.

- *What do you do with the packaging if you only use a number and mushroom and want to store the remaining mushrooms?*
(*Wat doet u met de verpakking als u maar een gedeelte van de champignons gebruikt en de overgebleven champignons wilt bewaren?*)

When the basket is half empty she puts it back in the fridge with the lid on top in the upright position. She has had that the lid cannot be clicked on top of the basket again. Recently she had been told that the lid can be put in the basket upside down when storing mushrooms. She would not have discovered this on her own.

- *When doing groceries, are you thinking of where you putting the mushrooms, on top or at the bottom of the cart? And why?*
(*Wanneer u boodschappen doet, denkt u dan na waar u de champignons neerlegt in het winkelwagentje, Bovenaan of onderaan? En waarom?*)

She makes sure more light products are in one bag and heavy products in another bag. She makes sure only light products are stacked on top of the mushroom packaging because she wants the mushrooms remaining fresh and unharmed during transport.

- *Can you explain this sign to me? Where can I find this sign?*
(*Kan u mij dit teken uitleggen? Waar is dit teken te vinden?*)

She thinks it is a recycling sign. She does not know what the number six or the "PS" means. Maybe you can find it on the label of a packaging, but she does not know for sure.

- *Can you tell me the functions of the lid of the blue mushroom packaging?*
(*Kan u mij de functies van de deksel vertellen van het blauwe champignonbakje?*)

You can turn the lid upside down after usage, which may provide a better seal and longer freshness of the mushrooms. The lid protects the mushrooms from influences from outside like pressure from other products on top. The holes in the lid are to let fresh air in the packaging, to keep the mushrooms fresh for a longer period of time. This packaging can easily be stacked which is more handy for people who work at the supermarket she says.

- *Can you tell me the story how you use this packaging and product from taking it out of the fridge till throwing it away?*

(kan u mij vertellen hoe u deze verpakking en de champignons gebruikt vanaf het pakken uit de koelkast tot het weggooien?)

When half of the mushrooms are still in the packaging she stores them in the fridge inside the packaging. When all the mushrooms are used she keeps the packaging empty and throws it in the plastic bin for plastic waste. She does not use the packaging as a waste bin, she tells that she has a separate bowl for green waste during cooking.

- *What do you like to improve to this packaging?*

(Wat zou u willen verbeteren aan deze verpakking?)

- She would change the colour to green, because she thinks people have an association of a more sustainable product when seeing a green packaging.
- Change the material, into one that is more easy to recycle, she would not mind to pay more for a more sustainable packaging.
- If the packaging could be made from cardboard it would be best in her opinion.

III Research

A Consumer research summary

Part one of the interview

The first question of the interview was if people actively think of sustainability when doing groceries at the supermarket. Most of the interviewees think about sustainability when doing groceries but in different ways. From the interviewees, the beliefs of sustainability differ. One wants less packaging to prevent having the entire kitchen counter full of plastics and the other thinks packaging are just unnecessary and have no reason being. As said in the literature research by Steenis (2017, p. 296), people rely on their own beliefs concerning the environmental impact of an object. This came to mind with answers from interviewees like I only look at packaged or not and not at materials and another interviewee looks more to the fruit or vegetable itself, its freshness. In appendix II part one are highlighted the answers of the people that prefer unpackaged fruit and vegetables. More interviewees said they prefer unpackaged fruit and vegetables over prepackaged fruit and vegetables, for some this could be a way of more sustainable grocery shopping. Volume is one of the factors of people buying unpackaged fruits and vegetables, the interviewee in appendix II C said that he rather buys unpackaged because he often needs one paprika and not three at once, paprikas are mostly packed in pairs of three. One of the interviewees stated that when taking a bag to put unpackaged fruit and vegetables in, it does not matter because you are still packing your product (appendix II N).

The number of reasons the interviewees gave on the question of why certain fresh fruits and vegetables are packaged differed. The three most named reasons were for hygienic reasons, against expiration and to have a predetermined volume of food. One of the interviewees explained that the packaging prevents people from touching all the food products, the packaging keeps the fruits and vegetables clean. Another reason which was said multiple times was that the packaging protects the fruit or vegetables from bruising when the packaging is squished. A packaging is more convenient as well during transport, this reason was connected to protecting the fruits and vegetables during transport by one of the interviewees. This question shows that people know certain reasons why products are packaged, and this could be part of making decisions when doing groceries.

To see what people attitude is towards separating a packaging, a packaging was shown which contained two types of material, a plastic bag and a cardboard tray. The results from the interview showed that $\frac{1}{3}$ of the interviewees separate the complete packaging, the cardboard in the paper bin and the plastic bag in the plastic waste bag or bin. Six of the interviewees would separate the packaging but throws the plastic in the residual waste bin. Four of the interviewees would not separate the packaging. These results are not significant, but it shows that most of the people do separate packagings made of multiple kinds of materials.

The last question of part one is to see what features of packagings have bothered the interviewees in their past. These features can be translated into design considerations to

improve in the packaging designed in this project. Multiple interviewees pointed out that some packagings are made of two kinds of materials, these are either separate from each other or melted together. In appendix II are these answers highlighted in green. The interviewee finds this unnecessary when a packaging consists of a cardboard tray with a plastic foil around it, this packaging could be made of one material. Another packaging which was named twice is a bread packaging with a front of plastic and the back of paper, these materials are melted to each other, and the interviewees do not know in which bin they have to throw it, so a confusing packaging for them in separating waste. Fruits and vegetables that are vacuum sealed come across as less attractive in appearance, as a less fresh product to some. Fruits and vegetables that are vacuum sealed can cause damage to the food itself when removed, an example is given by the interviewee in appendix II P, she tells that a nut butter cheese cannot be taken out of the seal without damaging the cheese. This is not a fruit or vegetable, but fruits or vegetables can also be damaged in the same way. The seal of the cucumber was named by 1/3 of the interviewees, this seal is also difficult to take off without damaging the vegetable. The named food packaging with a bag or netting were the mandarins with the plastic netting, the bread bag with a plastic front and paperback and the plastic bag you take when packaging unpacked fruits and vegetables. The mandarin packaging is difficult to rip open, even scissors are needed. The bread bag is confusing for the interviewees on how to sort and throw away. Recommendations from this could be that a packaging should provide clarity on how to sort it when disposing of and able to open without having to use a tool.

The plastic baskets have an issue which is pointed out with the use of different packagings. The lid pops off during transport in one of the stages of the packagings in which this happens. In appendix II O the interviewee said that the lid of the blueberries packaging sometimes pops open, which could be due to the thickness of the plastic or the plastic itself is too weak. The grapes basket itself tears under pressure and creates sharp edges, and the shape is relatively big and difficult to stack something onto because of the shape of the lid according to the interviewee (appendix II A). In appendix II J, the interviewee argues the sturdiness of the packaging under pressure and its ability to protect the fruits inside, and she has had that the packaging has torn and created sharp edges. She also thought that the shape of the lid is inconvenient for stacking products on top of it. It could be said that the shape of a packaging has an influence on the ability to stack products on top, and some packagings are more capable than others to carry a load on top. These experiences can show bad luck but maybe also a misjudgement of a packaging and its capabilities. A feature that one of the interviewees noticed is that tomatoes packaged in a cardboard tray with a plastic bag around it have no holes in the cardboard tray, this meant the water could not escape when washing the tomatoes (appendix II A). A design consideration from this observation is to keep the usage of the fruit or vegetable in mind in the design of the packaging. Another experience is that of the packaging of strawberries and raspberries. These are packaged in a sturdy plastic basket with a resealable foil on top. After opened once the seal of the foil is not strong enough to hold weight from products on top, which means you can not stack products on top of it (appendix II K). A top seal instead of hard plastic lid saves materials but has also its disadvantages.

The first part of the interview tells that most of the people separate their waste, but have found difficulties with packagings on how to sort them. Some packagings have created

inconvenient experiences which can be bad luck, the situation or something that could be improved to the packaging. Some of these experiences can be translated into design considerations and later translated into the program of demands and wishes. Because the mushroom packaging is designed with a point of view from multiple stakeholders it is important to first have an overview of experiences with other packagings, to learn from what is done already. As done in the part above. In the second part of the interview is discovered what people's attitude is towards the current mushroom packaging.

Part two of the interview

In the second part of the interview questions were asked to discover the consumer's attitude towards the blue mushroom packaging with the transparent lid. Most of the interviewees buy mushrooms in this packaging often, some do not because they do not favour them. The insights of people who do not buy the mushrooms are important as well because they may have different insights.

The interviewees had different opinions on the appearance of the mushroom packaging. The colour was seen by a part of the interviewees as ugly, while others found it pretty and outstanding against other packagings of the fruit and vegetable section in the supermarket, and to the other interviewees, it did not matter which colour the packaging is. Interviewees told they have made an association with the colour blue and mushrooms. One of them thinks the shape with the colour of the packaging has made the association with white mushrooms (Appendix II J). The results are not significant, they also deviate between the 15 interviews. No recommendations can be made concerning the colour and if the colour blue is preferred or not. The transparency of the packaging has been named. A few of the interviewees like to see through the lid to see all the mushrooms before buying them, but not all the mushrooms can be seen through the lid. An observation from this could be that people may like to see all the mushrooms when buying mushrooms in pre-packaged in a blue basket. Reasons the interviewees gave were; to see if the bottom mushrooms are bruised, to see the size of the mushrooms and to see if they are fresh and shiny.

In Appendix II P the interviewee tells that she has no association with mushrooms when seeing the colour but she has one when seeing the shape of the packaging. Others had no associations with the colour of the packaging. The shape is easy to stack and take out of the shelves and to place in your shopping bag, it is also a handy packaging to store mushrooms in (appendix II O). Another interviewee found the current mushroom packaging too square and the edges too sharp (appendix II N). People have used and seen this packaging for a longer period of time, which is noticeable in the given answers. People said for example that it has been like this for a long period of time. When people use a product for a longer period of time it could be they get used to features they did not like at the beginning. If this is the case with some or all the interviewees cannot be said. There are only a few variations on this mushroom packaging in stores, which makes people obligated to buy this packaging if they want to buy mushrooms. One of the interviewees explained that although she does not like the colour of the packaging, it will not hold her back from buying it (appendix II P). In short the packaging should have a level of transparency to be able to see the mushrooms, currently, they can be seen through the lid. Multiple interviewees mentioned that a more transparent packaging is convenient. This is not a significant result, but a design consideration for the design of a future mushroom packaging. If the colour needs to change,

cannot be taken from the opinions of the interviewees. As well as the shape, no significant direction in the opinion of the shape can be found.

The interviewees were asked to judge the mushroom packaging on sustainability. Most of the people did not think the mushroom packaging is sustainable, 13 out of the 15 interviewees thought it was not sustainable. A reason which was named multiple times was that it is made of plastic and that it is coloured plastic. The thin plastic of the packaging was also a reason. From the interviewees, the people associate a plastic packaging with an unsustainable product. The feel and appearance of the packaging also comes across as cheap according to some interviewees, this is also an indication of an unsustainable packaging they said. Coloured plastic is less sustainable according to a few of the interviewees. The part of the people who thought it is a sustainable packaging think that plastic can be recycled.

People make their own judgement on sustainability, which can be seen in the prediction of the consumer that plastic packagings are unsustainable. A recommendation can be to educate people about materials and sustainability.

Not every interviewee could name an inconvenient experience with the mushroom packaging.

The interviewees either had no bad experience or could not remember one.

The interviewees named the resealability of the lid multiple times. The lid cannot be clicked shut on the blue basket after taken off once. This created problems with storage of mushrooms and irritation at the consumers. One of the interviewees said that she knows that it can not be resealed and throws away the lid directly. It also happened that the lid popped off during transport. The part of the packaging which has room for improvement is the lid. Consumers have difficulties with resealing the packaging, with storing and keeping the lid closed during transport.

To discover if people store mushrooms inside the packaging after a number of mushrooms are used, the question was asked what they do with the packaging after using a number of mushrooms, and you want to store the remaining mushrooms. The lid of the mushroom packaging can be turned around to create a better seal on top of the blue basket, this possibility is not described on the packaging. It is also asked afterwards if people are aware of this possibility.

Most of the interviewees store the mushrooms inside the packaging with the lid on top in the upright position. In multiple interviews was mentioned that the lid cannot be resealed. Some do not use the lid and/or the packaging. Only 2 out of the 15 interviewees do turn the lid upside down in the blue basket when storing mushrooms inside the packaging. There is no information about how to use the packaging on the packaging itself, depending on the interviews, it can be argued if the packaging should contain more information.

To get an impression of people's behaviour with the mushroom packaging and about how strong they believe the packaging is, the question was asked where they put the packaging in the shopping card. Most interviewees pay attention to where they place the mushrooms in the shopping cart, they either put the mushrooms on top of other products or only stack

lighter products like other fruits and vegetables on top of the mushrooms. According to one of the interviewees, white mushrooms turn brown when they are crushed or when pressure is applied to them, and you want to keep them white (Appendix II D). Other interviewees do not pay attention to where they place the mushrooms in the shopping cart or shopping bag, they expect the packaging to be strong enough to protect the mushrooms. Most of the participants do pay attention to where they place the packaging. Still, light products are stacked on top. The recommendation from the answers to the question is to make sure that at least light products can be stacked on top of the mushroom packaging, without harming the mushrooms inside the packaging.

The resin identification code is stamped into every plastic packaging and says something about the recyclability of the material. The results show that 3 out the 15 questioned consumers know what the resin identification code means and know where it can be found. The other 12 consumers do not know what it means or they expect it to have something to do with recycling. Almost all of these consumers did not know where the sign can be found. The resin identification code is not clear to most consumers, and so more difficult to get information about the packaging across, also because most consumers do not know where they could find the sign.

To see what the consumer knows about functions a lid, the consumer was asked to tell the functions of the lid of the mushroom packaging. The information displayed on the mushroom packaging is little. On the packaging is only one sticker with a barcode and a little information about the product. The functions need to be distracted from the cues of the packaging itself.

From the interviewees, only 4 consumers knew the lid can be turned upside down into the blue basket when storing mushrooms inside the packaging. One of the interviewees was told recently about this function. One interviewee thinks you can push the lid shut onto the blue basket after taking it off once. Other functions which most interviewees mentions were, air holes to let air in and out of the packaging, protection of the mushrooms from forces and influences from outside, the shape of the lid is handy for stacking during transport, to keep the mushrooms together in the packaging when the packaging is dropped or when it lays upside down. An observation during an interview was that the interviewees said that no information is given on the packaging about the functions of it. They should explain that the lid can be turned upside down in the blue basket when storing mushrooms, this was after I showed this to the unknowing consumers. A recommendation could be to make a packaging with more explanation about the usage. One of the interviewees told that he sometimes used the lid as a waste tray during cooking (Appendix II O). This is another is another way of using the packaging, which means the packaging can be used in more ways than only for storing mushrooms.

The next question I asked the interviewees was if they can tell me the story about how they use this packaging from taking the packaging out of the fridge till throwing it away. With this question, other ways of using the packaging by the consumer can be identified. In the interviews, one activity with the packaging was identified, which is putting food waste into the blue basket or on the lid when cooking. The packaging is used as a temporarily green waste bin. After cooking all the interviewees who use the packaging this way throw the

green waste into the green or garden waste bin and the plastic packaging into the plastic bag for plastic waste or the residual waste bin. Around 2/3 of the interviewees keep the packaging empty after throwing taking all the mushrooms out, the packaging is then thrown away into the bin directly or after cooking. Using the packaging as a temporary waste bin for food waste by some of the consumers can be something to take into account in an early design stage. In short, the packaging is not only used to store mushrooms but also as temporarily green waste bin by some consumers.

After all the other questions the consumers have thought about the mushroom packaging in detail and may think of improvements they would like to see done to the current mushroom packaging or to a new mushroom packaging. All improvements are summed up together and summarized. Some improvements are also recommendations. The improvements that the interviewees thought of are summed up below. The most named improvements are on top off the list.

- The lid should be resealable, that it can be clicked shut onto the blue basket after usage.
- Giving the packaging stronger plastic for stacking purposes.
- Make a lid that stays on the packaging in multiple sorts of situations.
- Make a packaging that can be decreased in size, to save space in the bin.
- The blue colour is associated with mushrooms.
- Making the packaging stronger to be able to stack more onto the packaging.
- If the colour of the packaging is transparent the consumer is able to see the mushrooms at the bottom of the packaging.
- The appearance of the packaging in more a more natural shape and natural colours.
- The shape of the packaging is less convenient for the mushrooms. Looking at the shape of mushrooms, air gets trapped into the packaging because mushrooms have a rounded shape and the packaging is a square basket.
- A sticker on the packaging which shows where the mushrooms are grown and more information about the packaging itself.
- Keep the shape the same for transport efficiency.
- There could be more information on the packaging about the mushrooms and about the packaging.
- Make the packaging more sustainable.
- The opening of the lid could be difficult for people who have less strength in their hands.
- A packaging which is more flat so mushrooms can lay beside each other.
- Change the colour of the packaging into green, people may have an association of a more sustainable product with a green packaging.
- The portions of mushrooms are too big for most consumers, smaller portions would be better.
- Change the material into a better recyclable material even maybe into cardboard.

The most named improvements are already named before in the design considerations or are going to be named. The colour of the packaging is analysed above and there is no significant value if people really have an association with the colour or not.

These recommendations can be translated into design considerations. The blue colour has also a function as said in the interviews with Verstappen advanced packaging and with the KIDV. The functions was to let the mushrooms appear more white. The blue colour has its functions and can be used in a new packaging. An interesting improvement is to make a solution that people can see the bottom mushrooms inside the packaging, this was also named earlier in the interviews by some interviewees. A new improvement is to be able to decrease the mushroom packaging in size to save space in the bin. By saving space more waste can be thrown away of more can be collected by the consumer and it could be beneficial if the consumer wants to move his plastic waste. The packaging should be sealed better, this is an improvement that has been named throughout the interviews. A stronger packaging to be able to stack more onto it, above has been found that the ability to stack more unto the packaging has different opinions. The other improvements are already named before in the report or are already obvious to be improved, for example making the packaging more sustainable.

Conclusion:

The answers given on the questions have given insights into the attitude of consumers towards sustainability and about their knowledge about packagings. The results that are obtained in this research are not significant, because not enough consumers were interviewed to get significant results, this was qualitative research.

From the given answers could be concluded that most interviewees prefer unpackaged products. When consumers do groceries they have their own thoughts about the sustainability of a product, which can also mean that the reasons for buying certain products can be different per person. The three most named reasons why fruits and vegetables are packaged, were hygienic reasons, against expiration and to have a predetermined volume of food. Most of the people do separate a packaging made from multiple materials, some throw away the plastic packaging in the residual waste bin and others throw it away in the plastic bag for plastic packagings. The consumers have had inconvenient experiences with packagings, one of the experiences is with a packaging made of multiple materials that are attached to each other, the interviewees did not know how to separate this packaging. Another packaging that was named multiple times was a tight seal around food products, this packaging is difficult to take off without damaging the food product according to multiple interviewees. Multiple inconvenient experiences are identified and considered to be design considerations.

In the second part of the interview questions were asked to discover the consumer's attitude towards the blue mushroom packaging with the transparent lid. Most of the interviewees buy this mushroom packaging often.

The results of this part of the interview are not significant as well, but directions are identified that can be translated into design considerations. From the interviewees could be concluded that people like to see the mushrooms at the bottom of the packaging, which translated into the direction that the packaging should have a certain level of transparency. The opinions of the colour of the packaging differed, which means no recommendation could be given, which was the same concerning the shape of the packaging.

Consumers make their own judgements about sustainability, which could be seen in the answers given on the question if the mushroom packaging is sustainable. A part of the interviewees answered that it is unsustainable because it is plastic without knowing why. It was found that the interviewees had difficulties with the lid of the packaging. The lid is hard to reseal when the consumer wants to store the packaging, also the lid can pop open during transport. During transport and when doing groceries, consumers do pay attention to where they place the mushrooms in the shopping cart and the shopping bag. From the interviewees who do stack products on top of the mushrooms, most of them only stack light products on top. The resin code on the packaging was unclear to most interviewees, they did not know what it meant or where they could find the code. Some guessed that it has something to do with recycling. Not knowing what this sign meant or where you could find it. This means that getting information across about the packaging itself is difficult.

Most of the questioned consumers did not know the lid can be turned upside down into the blue basket when storing mushroom, which is also not explained on the packaging.

Interviewees mentioned that there should be more information on the packaging of the usage of the packaging. The packaging itself is also used as temporarily waste bin to store green waste during cooking.

The consumers have multiple insights for improvements to the mushroom packaging. A new insight was to be able to decrease the mushroom packaging in size before throwing it into the bin, to save space inside the bin. Another improvement is having the ability to reseal the packaging, a lid that can be reclosed. The interviews have given insights into the point of view from the consumers about sustainability and their thoughts about packagings in general and about the mushroom packaging.

Discussion:

The study into the attitude of the consumers towards sustainability and the mushroom packaging has delivered insights which are used in the design process of a new packaging solution for the mushrooms. The results obtained by the interview are not significant, this because qualitative interviews were held, but the number of interviewees is not enough to have significant results. If more people were questioned analyses could have been done to see if correlations exist between, for example, the colour of the mushroom basket and the age and gender. To see whether and an association between mushrooms and the colour blue exist. Quantitative research could be done as well to have more data in a shorter amount of time and to get significant results. The number of questions worked well to let people think more about the mushroom packaging, on first sight not much could be improved to the packaging according to the interviewees, but after the interviewees hold and saw the packaging for a few minutes they came with more answers. The packaging has been like this for some time, which could have led to people getting used to inconveniences. From the interviews are recommendations made, which in combination with other data lead to demands of the program of demands and wishes. Some questions could also be answered by observational research, when people take the packaging in the supermarket or when people are cooking or when they throw the packaging away. The interviewees have explained their thoughts and actions well, to have sufficient research.

Design considerations:

- The packaging should provide clarity on how to sort it when disposing of.

- The packaging should be opened without having to use a tool.
- The packaging must be able to be decreased to save space in the bin.
- Inform the consumer about the mushrooms, where they are grown.
- Inform the consumer about the packaging itself.
- A design consideration from this observation is to keep the usage of the fruit or vegetable in mind in the design of the packaging.
- The consumer likes to see the mushrooms at the bottom of the packaging when buying mushrooms.
- The packaging must look and be hygienic
- The packaging should be able to cope with light products that are stacked on top.

III

B Recycling processes

Recycling Processes

Introduction

The perfect situation is a circular economy in which all products are recycled and remade into the same product or another product. According to the document in appendix D, circular thinking is beneficial to save virgin resources. When products are recycled the materials are reused and less virgin material needs to be used. In 2015, PlasticEurope is stated, "Recycling is the preferred option for plastics waste. However, when recycling is no longer the most sustainable option, energy recovery is the alternative. Both options complement each other and help realise the full potential of plastics waste." Currently, there are two types of recycling, mechanical recycling and chemical recycling. The two processes are explained to get an idea of how they work and to know if they can be used with the new packing solution for mushrooms. The current packaging is made of PS, a material that can be recycled well if collected separately from the residual waste stream (Recycling.nl, n.d).

- *Mechanische recycling*

Mechanical recycling of plastics is the conversion of plastic waste into secondary resources or products, with this conversion the chemical structure of the material does not change significantly (PlasticsEurope, n.d.). In mechanical recycling, the waste first needs to be become raw material before becoming a new product. All plastics products are collected together and can be contaminated by each other. Mechanical recycling does not change the molecular structure, the contaminations cannot be extruded from the material. This is why only the material PET can be remanufactured into a food packaging, PET has his own waste stream. If PET packagings are not separated by the consumer and thrown away with other plastics they cannot be manufactured into a food packaging. Before the plastic waste can be made into a new product it needs to be made into raw material. Ragaert, Delva, & Van Geem (2017) write that the polymers PVC, HDPE, LDPE, PP, and PET are most applied in packagings, and PET is almost only used as packaging material. In the paper of NRK Recycling (2015) in combination with the paper of Regaert et al, (2017) the following steps of mechanical recycling are identified:

Step 1:

- Collecting of the all plastic waste.
- Rough sorting on type of plastic, colour and cleaning of contaminations
- Baling of the sorted waste, for ease of transport and to save space and transport costs.

Step 2:

- First the baled plastic waste goes through a crude shredder, to decrease the size to fist-side particles.
- Now the particles are washed in a rotating drum, this drum creates gravitational forces to filter out other materials than plastics.
- The particles now go through friction washers, which removes organic waste which sticks to the plastics.

- Now through a second shredder which, creates plastic flakes with a size of 10 to 12 mm.
- The flakes are washed again now in a second friction washers.
- To separate the flakes from different types of plastics a floating- sink installation is used. In this installation the flakes are led through different solvents with different densities because of the different densities some plastics will float and some sink. This process is done several times to sort the different plastics from each other.
- After the floating-sink installation the plastic is dried and ready as raw material.
- Another way of sorting hard plastics from foils is the wind sifter, in which an upward airflow removes all soft particles like foils.

Step 3:

- The last step is melt filtration, in which the material is melted and unmelted contaminations stay behind, this process takes place inside an extrusion installation. The end result is a granulate from a certain size, the recycled resource of a certain plastic.
- Inside the extruder additives can be added, such as virgin materials, colour additives and filler additives and other additives. When additives are added to the recycled materials in the extruder an homogeneous distribution takes place (NRK Recycling, 2015).

If the resources does not have the quality standard, demanded by economic and environmental reasons to be recycled to the set standards. The resources can then be used to resource recovery solutions, like recycling of resources and the recovery of energy (PlasticsEurope, n.d.). The mushroom basket which is made from PS can be recycled using mechanical recycling, the most important is to separate the packaging from the residual waste. If the mushroom packaging is recycled starts at the consumer.

(Infographic mechanical recycling)

- *Chemical recycling*

Chemical recycling is a new kind of recycling which still in development, this moment pilots are taking place in which products are produced from chemically recycling materials (BASF, n.d.). The chemical recycling process produces recycled material from the plastic which can be used as fossil resources for chemical production (BASF, n.d.). In chemical recycling depolymerization of the polymers of the waste takes place, in which the monomers are purified from contaminations (Grigore, 2017). After this this process a pure polymer is produced, these polymers are known to us as the granulate. In research from KIDV (2018) states that two chemical recycling processes have outputs of plastic granulate, these processes are Solvolysis and Depolymerization. These are the only two processes which are named in this report because a closed loop circulaire economy is preferred in which the packaging can be recycled into a food packaging again. These two chemical recycle processes produce a high quality output which can be made into a plastic granulate (KIDV, 2018).

Depolymerisation: In this process the polymers are brought back to monomers and contaminations are purified out the the material, colours can be purified out of the packaging

as well (KIDV, 2018). An example of a depolymerization process in Glycolyse, a material that can be depolymerized with this method is PET.

Solvolysis: A type of solvolysis is hydrolysis, this is the reaction of a material with water under neutral, acidic, or basic conditions at high temperature and pressure, which breaks the polyester chain (Rageart et al., 2017). This can also be done with other solvents. PS is one of the materials that is the output of a solvolysis process called Creasolv, and PS is the material out of which the current mushroom packaging is made.

Conclusion

In short, the two types of recycling which are described in short are ways to recycle a packaging. Mechanical recycling is already in use in the Netherlands and chemical recycling is still in development.

C End of life processes explained

When a product is going to be disposed of it is in its last life cycle phase, which is called the end-of-life. "An end-of-life (EOL) product is a product that does not receive continuing support, either because existing marketing, support and other processes are terminated, or it is at the end of its useful life." (Techopedia, n.d.). After the product is taken out of the package, the function of the package is finished, but some packages do have an extra function after the product is taken out. For now, it is assumed that the package finished its function when the fruit or vegetable is taken out of the package. The package is thrown away and will be processed at an end of life treatment, either through incineration, landfill or recycling. If a product is made of multiple materials it could be processed through multiple end-of-life treatments.

1. Incineration

Incineration is an end of life process in which the product is burned, with burning the waste energy is generated. The RVO (n.d.) states that from burning the waste energy is released which can be used to make electricity and heat is generated that can be used elsewhere, most of the released energy is reused. When a package is burned the resources are lost, which means virgin resource needs to be manufactured for a new product. In the Netherlands, we incinerate 7,6 million tons of waste every year, from the energy that is generated by this waste is half from biowaste (RVO, n.d.). The ideal situation of a products life is a closed loop in which the product is produced, used and recycled and continuous as the same or a different product. In this loop, the carbon footprint of a product is low because the materials of the product are saved and reused. In this project, the incineration process at the end of life is trying to be avoided, because of a closed loop lifecycle better for the environment because the materials are reused.

2. Landfill

The landfill is the least desirable way in the Netherlands of disposing of waste, there is a restriction in dumping materials that are recyclable and flammable. With landfill waste is stored in the ground isolated from groundwater, air and rain. The isolation is done with a bottom liner and with covering the waste with soil (C. Freudenrich, 2000). Waste which is dumped as the landfill is not meant to compost, that is a different kind of disposing of waste. The landfill is used as temporary storage or long time storage. With a compost pile it the purpose is to let the waste decompose as quickly as possible. With landfill, the life cycle of a product is interrupted or ended. In this project, the landfill is trying to be avoided. No household waste was dumped as landfill in the Netherlands, which means that most packages will be either recycled or incinerated.

3. Recycling

The recycling process is the most efficient way of disposal of waste. With recycling, the waste is brought back to its resource. The CPB (2017) writes that the currently collected plastic waste is recycled to a lesser quality product, which means material quality is lost. Before the recycling process the materials need to be sorted, the better the sorting the higher the quality of the recycling. The sorting machines of recycling companies can distinguish different materials with different processes, for example, metals can be taken out with magnets and solutions with different densities make some plastics sink and others float. The sorting of the material starts at the consumer who has to sort the product in the designated bin. The consumer does not always know the differences between plastics (appendix I F). Some recycled products return to be the same product again and other become different products. Packages are mostly made of plastics and/ or cardboard. It differs per plastic and cardboard if it can be recycled. In an interview with the company Renewi, was explained that If a product is made of multiple materials it is not always possible to sort the materials for recycling and so it will be incinerated, an example is milk boxes which are laminated from the inside (appendix I F). With the recycling the life cycle of a product start again with the same material, by recycling the carbon footprint of a product is kept lower than using virgin materials. By reusing materials the “plastic soup” is not supplemented. The goal in the future is to recycle 100 % per cent of the waste, but retaining the quality of the materials when recycling is an important goal as well. In the material research for the new packaging solution, there will be looked at recyclable materials.

IV Data

A Current packaging material research

To identify the material of the packaging the ID resin code was used, to identify the material of the foils used in the packaged the website of the organisation “NNZ the packaging network” was used (<https://www.nnz.nl/>).

The identified packaging materials are: cardboard, wood, and plastics. The identified packaging plastics are: PET, R-PET, PE, PP, PS, AND PVC. Each material has its own values concerning carbon dioxide footprint in production and recycling. Each of the materials is researched on properties and on toxicities. In food packaging it is desired to have material which is non toxic. The packaging solution must have a lower environmental impact than the current available packagings, which is why the current materials are researched on carbon footprint and toxicities. The properties are stated in words as well to inform about the possibilities of the material in packaging.

Paper and Paperboard

According Marsch and Bugusu (2007), there are multiple types of paper and paperboard used in the packaging industry, all with different properties and purposes. Paper is always treated, coated, laminated, or impregnated with materials to enhance the desired properties. According to Pongrácz (2007), carton is 100 percent recyclable after usage and can be manufactured into a food packaging after recycling. Pongrácz (2007, p. 243) states: “Proper management of forests can guarantee a continued supply of wood for paper and other purposes”. According to CES Edupack (2018), the carbon footprint of paperboard in production and recycling is the same or lower than most plastics. Paperboard has higher weight than paper and is made from multiple layers, paper is lighter and is not able to store food for longer period of time because poor barrier properties (Marsch & Bugusu, 2007). Paper and paperboard have properties, which could play a part in making a packaging with a lower environmental impact than current plastics packagings.

PET

Pet is also called Polyethylene terephthalate (Marsch & Bugusu, 2007). PET has the following properties according to Marsch and Bugusu (2007): good resistance to heat, mineral oils, solvents, and acids. Other properties of PET are the transparency of the material, the light-weight of the material, shatter resistance, and gas barrier properties. It is not resistant to bases solutions. PET is used in chapter “3.2.6 Disposal company”, it was named that PET bottles are collected separately in the supermarket and can be recycled into a food packaging. In table xxx it can be seen that multiple packagings are made of PET. PET is a stable material and does not contain BPA, phthalates, dioxins, lead, cadmium or endocrine disruptors (PET Resin Association, 2015).

R-PET

R-PET is recycled PET material, this can contain different percentages of recycled PET. When recycling of material the properties downgrade, in this report it is assumed that the

properties of the material stay the same after recycling. The assumption is also made that recycled material does not need additives or virgin material to reach the properties of virgin material. The properties of R-PET are assumed to be the same as virgin PET. The carbon footprint of 100 percent recycled PET is set on 1,175 kg CO₂e/kg for now, this value is calculated with a PET tray of mushroom (Dormer, Finn, Ward & Cullen, 2013).

PE

There are two types of polyethylene, low density and high density. Polyethylene is a thermoplastic, it liquifies at a certain temperature and hardens if cooled again. According to Marsch and Bugusu (2007): "High-density polyethylene is stiff, strong, tough, resistant to chemicals and moisture, permeable to gas, easy to process, and easy to form". "Low-density polyethylene is flexible, strong, tough, easy to seal, and resistant to moisture". Both high-density as low-density polyethylene can be recycled. High-density polyethylene is mostly used to make bottles, margarine tubes, and bags like retail, grocery and trash bags (Marsch & Bugusu, 2007). Low-density polyethylene is transparent, and is used in film applications, bread and frozen food bags, flexible lids and bottles, and with products which need hot sealing (Marsch & Bugusu, 2007).

PP

Polypropylene is a material fit for recycling and reuse. In comparison to Polyethylene it is harder, denser, and has a better transparency level (Marsch & Bugusu, 2007). The has good chemical resistance and has a melting point of 160 degrees, which makes it suited for packagings which need to withstand heat.

PVC

Polyvinyl chloride is a transparent material, which is resistant against acids and bases, grease and oil (Marsch & Bugusu, 2007). The material is good for thermoforming. Polyvinyl chloride is made by polymerisation of vinyl chloride, the chloride content creates environmental problems when incinerated by the emissions of toxics. Dioxins are emitted with the burning of vinylchloride, which are harmful for the environment, but dioxins are also carcinogenic (Vinyl Council Australia, n.d.). Dioxins are considered highly toxic. Because of the toxic of vinyl chloride, it brings dangers in transport as well. Polyvinyl chloride (PVC) have raised concerns about human health risks, because of used plasticisers in PVC. These plasticisers are named bisphenol A (BPA) and certain phthalates (Ellen MacArthur et al, 2016). According to Marsch & Bugusu (2007), recycling of PVC brings difficulties because the material is used in a widespread of products, which makes it difficult to identify and separate. According to CES Edupack the carbon footprint of 1 kg recycled PVC is 0,8 kg, but it does not tell about the toxics and the difficulties in separating and identification. The carbon footprint does not tell everything of a material.

PS

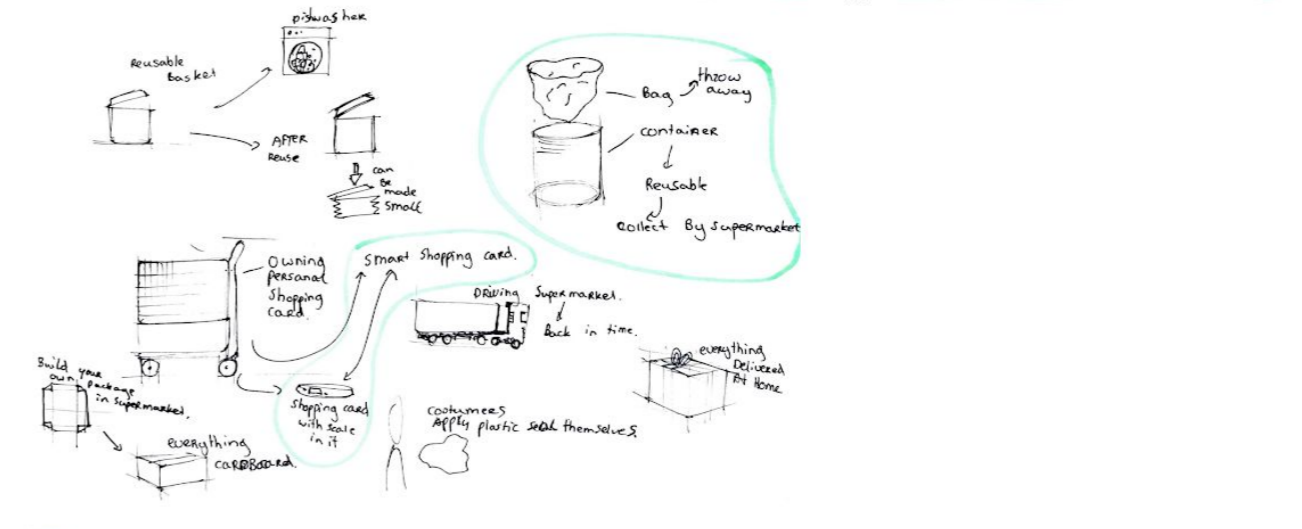
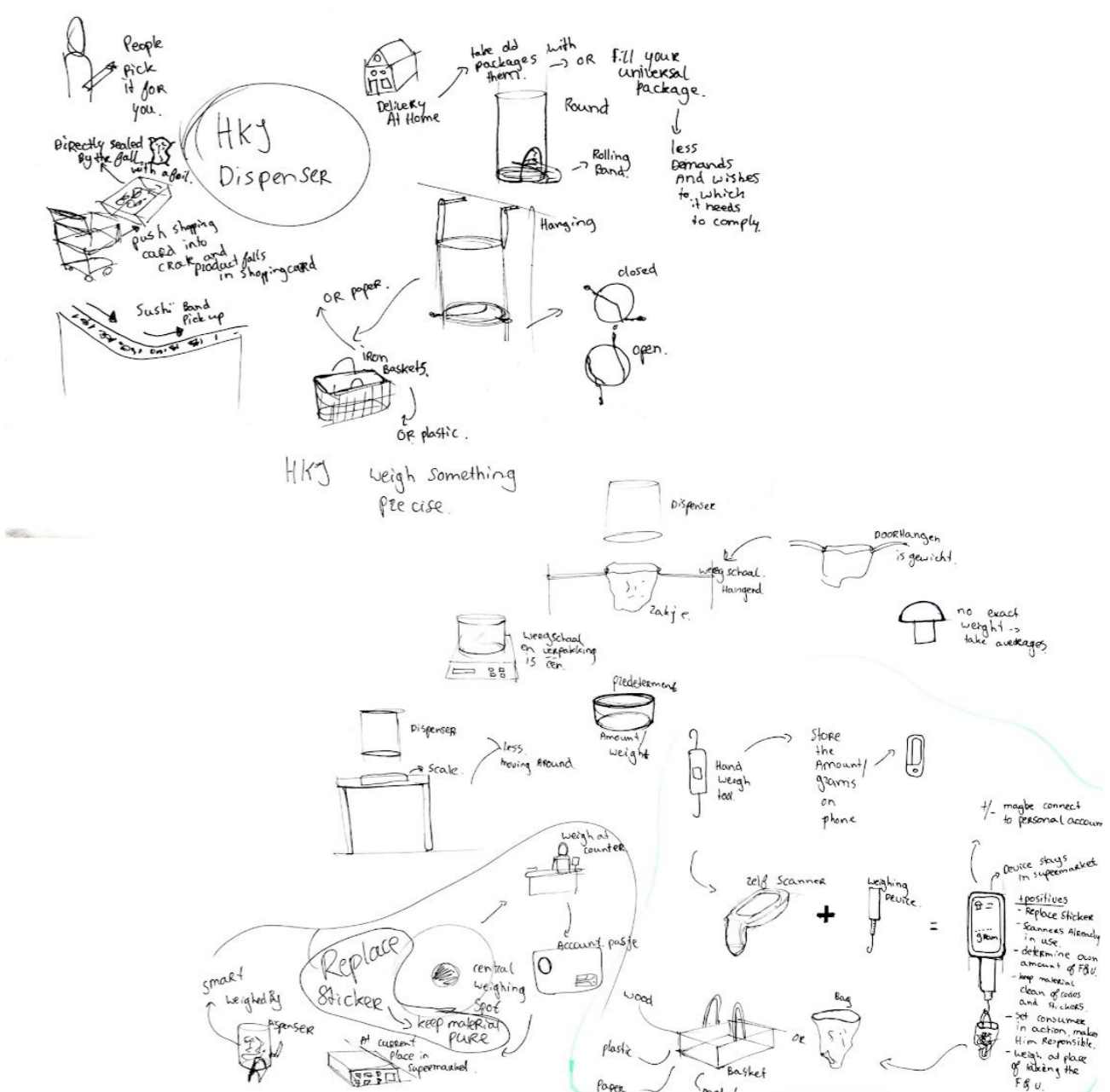
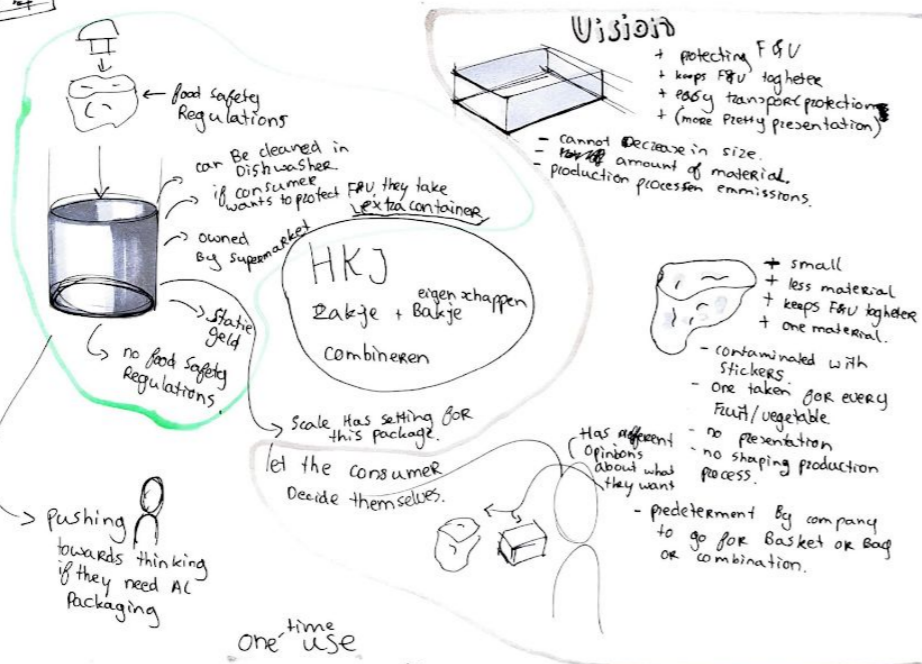
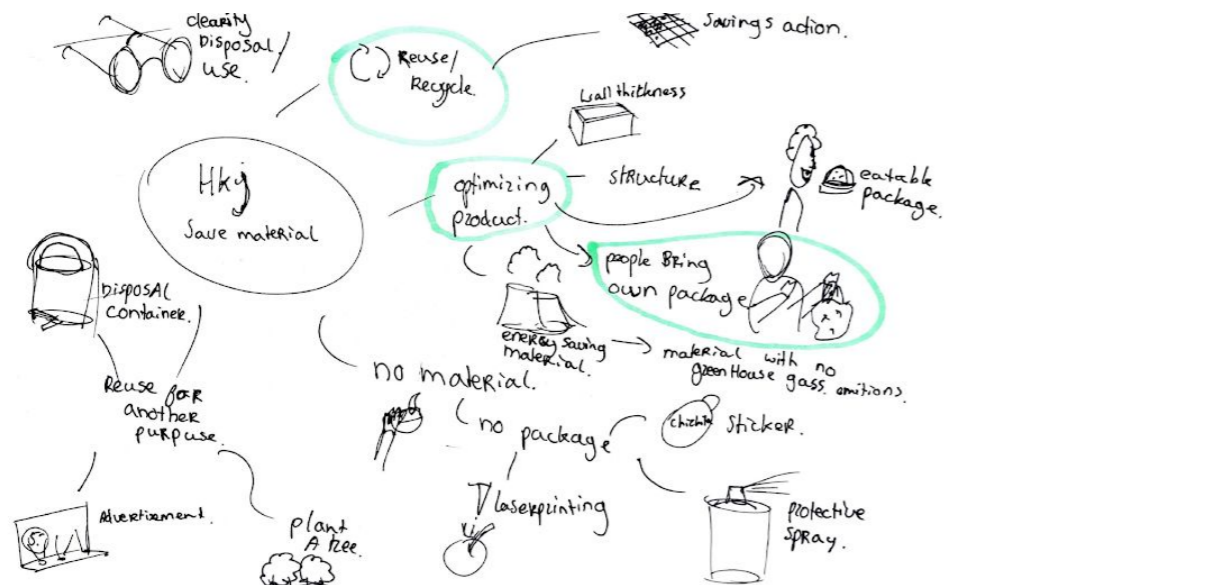
According to Ms C. Ouwehand from KIDV, polystyrene is shatter resistant and because of the material properties, a packaging can be constructed thin (appendix I F). According to Marsch and Bugusu (2007), polystyrene is transparent, hard, brittle and has a relatively low melting point. Polystyrene can be recycled or incinerated, by incineration toxins are emitted. The direct inhalation of styrene can give irritations and lead to "styrene sickness"

(Wakefield, 2007). Looking at the carbon dioxide footprints of polystyrene in production and recycling, it can be seen that the are high compared to the other materials. From the carbon dioxide footprint data it is concluded that there are materials available which emit less carbon dioxide in production and recycling of 1 kg polystyrene.

B

ISO Afk.	Drijft	Brand- / Dooftijd	Vlamkenmerken	Rookkenmerken	Brandgeurkenmerken	Uiterlijke Brandkenmerken
PA	nee	dooft direct	zwak, lichtgrijs	grijs na het uitblazen	verschroeid haar	trekt draden
PVC	nee	dooft direct	geel groen met zwarte rook	grijs na het uitblazen	scherp / zoutzuur	verkoold oppervlak
PC	nee	dooft na 20 sec.	oranje geel met zwarte rook	grijs na het uitblazen	ziekenhuislucht	verkoold met blaasjes
PETP	nee	dooft na 20 sec.	oranje geel met grijze rook		zoetig	-
PF	nee	dooft na 20 sec.	geel zonder rook		amoniak	verkoold
ABS	nee	blijft branden	geel met blauwe kern	walmende roetvlagen	hyacint	verkoold
PMMA-XT	nee	blijft branden	blauw gele top	grijs na het uitblazen	zoetige fruitgeur, sinaasappel	-
POM	nee	blijft branden	blauw transparant	grijs na het uitblazen	doordringende formalinegeur	kan druipen
PUR	nee	blijft branden	helder geel		onaangename amandellucht	kan druipen
PTFE	nee	brand niet	moeilijk ontvlambaar (Giftig)		niet inademen (giftig)	zwellt iets en verkoold
PVDF	nee	brand niet	moeilijk ontvlambaar (Giftig)		niet inademen (giftig)	verkoold, kunststof wordt doorzichtig
PE	ja	blijft branden	blauw gele top	grijs na het uitblazen	kaarslucht na het doven	druipt, makkelijk krasbaar
PP	ja	blijft branden	blauw gele top	grijs na het uitblazen	kaarslucht, gemengd met wierrook	druipt en is moeilijk krasbaar

Figure retrieved from Vink Kunststoffen (n.d.).



VI Amount of packaging

A Estimation of the amount of packaging the grocery bag solution needs to have

Average amount of grocery shopping a week: 2-3 (Deloitte Accountancy & Advies B.V., 2015)
 Average household in the Netherlands: 2.2 (Centraal Bureau voor de Statistiek, 2018b)
 Average consumed vegetables daily in the Netherlands: 139 gram (Rijksinstituut voor Volksgezondheid en Milieu, 2018)
 Average consumed fruits daily in the Netherlands: 130 gram (Rijksinstituut voor Volksgezondheid en Milieu, 2018)
 Average mushroom packaging weight: 250 gram

Estimation:
 $(2,2 \times (3,5 \times (139 + 130))) / 250 = 8$ packaging

Reflection

The amount of packaging is based on the grams of a filled mushroom packaging, because it is an estimation and no data about the sold gram of separate fruits and vegetables was available. The mushroom packaging was chosen because it is the focus of this project. The calculation of the amount of packaging is now based on weight not on volume, the weight is translated into the volume by dividing it by a 250-gram mushroom packaging, which results in the amount of mushroom packaging needed. Also, the calculation is based on the average amount of persons per household in the Netherlands. This means if families are larger more packaging volume is needed. The packaging solution will get multiple size packaging, which makes the total packaging volume of the grocery bag buddy bigger, but the tree itself should be made extendable to enable have more packaging in it. This is not a precise calculation, but in the limited time available, it gives a rough estimation of the minimum packaging needed.

VII The mushroom

A Information about the mushroom itself

The white mushroom.

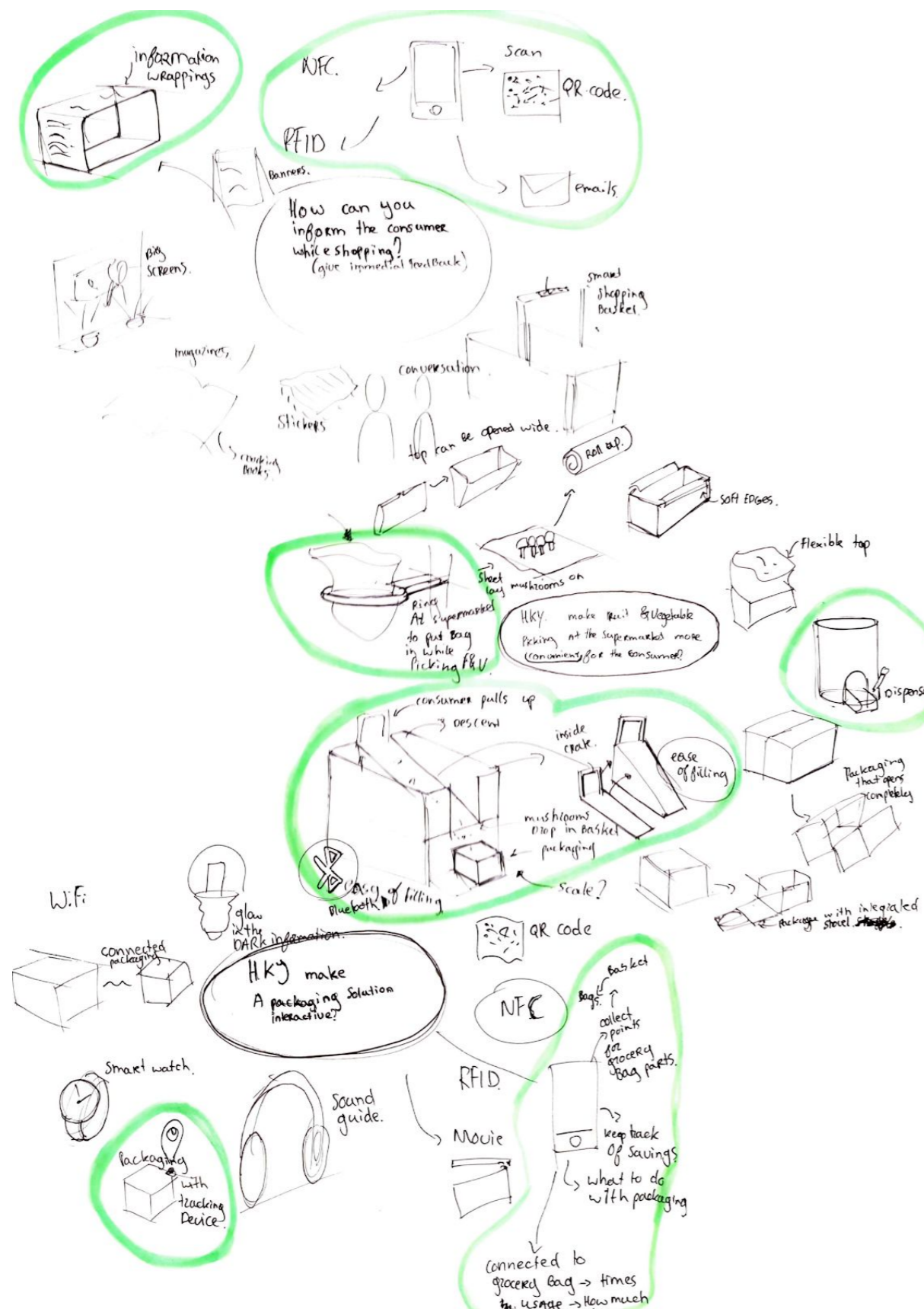
The white mushroom is grown all year, and is sold in small, middle and giant size (Banken Champignons B.V., n.d.-a), (figure 12). The different size mushrooms also have different packaging. The white mushroom is known to be a vulnerable vegetable, which could be why it is packaged in a protective packaging. The mushrooms are grown in the ground in rooms with autumn climate, the rooms have the optimum humidity and temperature (Van Asseldonk Champignons, n.d.).

The chestnuts mushroom.

The chestnut mushroom is the brown type of the white mushroom, which is grown at a lower temperature than the white mushroom (Banken Champignons B.V., n.d.-b), (Figure 13). Also, the flesh of the chest mushroom is more firm (Banken Champignons, n.d.-b). This could mean it is less vulnerable to pressures than the white mushroom.

Usage of the mushroom

Before cooking the mushroom it needs to be cleaned of dirt. It is advised not to clean the mushrooms with water because it absorbs the water, which spoils the flavour (Banken Champignons, n.d.). To clean the mushrooms it is advised to use kitchen paper or a brush.



B Mushroom packaging

Supermarket mushroom packaging

The following packaging are collected at the fruit and vegetable sector at the supermarket. Below every packaging the type of mushroom, the packaging material, the packaging functions, the packaging features and the packaging experience is stated.



Type of mushrooms: White mushrooms

Packaging material: PS

Functions packaging: Containment, Convenience, protection, presentation, preservation

Packaging features: Air-holes, strengthening structure, bottom structure

Packaging experience: The packaging feels rigid. The material is fragile, and cracks relatively easily. The walls of the packaging are not resistant to forces from the sides.



Type of mushrooms: Biological chestnut mushrooms

Packaging material: PS

Functions packaging: Containment, Convenience, protection, presentation, preservation

Packaging features: Air-holes, strengthening structure, scotch tape to secure the lid, bottom structure.

Packaging experience: The packaging feels rigid. The material cracks relatively easily. The lid came lose of container in the shopping bag, and the lid has a blue glow to it.



Type of mushrooms: Chestnut mushrooms

Packaging material: PET + PP/ PE top seal

Functions packaging: Containment, Convenience, protection, presentation, preservation

Packaging features: strengthening structure, single use top seal, bottom structure.

Packaging experience: The basket feel rigid and flexible. The material flexes back when the sides are pushed together. The trapped air inside the packaging makes it stronger. The packaging is not totally filled, to protect the mushrooms.



Type of mushrooms: Chestnut mushrooms vitame D*

Packaging material: RPET + PP/PE top seal

Functions packaging: Containment, Convenience, protection, presentation, preservation

Packaging features: Air holes, strengthening structure, single use top seal, bottom structure.

Packaging experience: The container is flexible, but strong enough to protect the mushrooms. The brown colour of the packaging makes it look like an older packaging. The brown colour does not make the mushrooms appear more fresh.



Type of mushrooms: Chestnut mushrooms

Packaging material: PS and PVC foil

Functions packaging: Containment, convenience, protection, preservation

Packaging features: Plastic wrapped around complete packaging, strengthening structure, bottom structure

Packaging experience: The container feels rigid. The container cracks relatively easily when flexed. The foil stretches, but can relatively easily been torn. The foil feels a bit sticky.



Type of mushrooms: Chestnut mushrooms/ White mushrooms

Packaging material: PET

Functions packaging: Containment, convenience, protection, presentation, preservation

Packaging features: Air-holes, strengthening structure, bottom structure.

Packaging experience: The packaging feel rigid and protective, but also flexible. When crushed the packaging flexes back to the original shape. The packaging feels more valuable then the polystyrene packaging, because of the flexibility. PS packaging is replaced for PET packaging for recyclable properties and presentational reasons (Ketelslegers, 2018).



Type of mushrooms: White mushrooms

Packaging material: PET + PP/ PE top seal

Functions packaging: Containment, Convenience, protection, presentation, preservation

Packaging features: strengthening structure, single use top seal, bottom structure.

Packaging experience: The basket is rigid and does not feel brittle. This packaging is filled till above the basket its edge, which means the mushrooms are not protected from forces from above. The top foil is tensioned because of the amount of mushrooms, this is not convenient with stacking.



Type of mushrooms: Chestnut mushrooms

Packaging material: PP/ PE bag

Functions packaging: Containment, Environmental responsibility, brand communication, presentation, preservation

Packaging features:

Packaging experience: The plastic bag cannot be stretched, and is relatively easily ripped. The packaging is not convenient when only using a part of the mushrooms, and wanting to store the remaining. The advantage of a plastic bag is the transparency, and the ability to move the mushrooms inside the bag.

Mushroom packaging found at the food market



Type of mushrooms: All kind of mushrooms
Packaging material: Kraft paper
Functions packaging: Containment, Brand communication, environmental responsibility, economy
Packaging features:
Packaging experience: The material is sturdy and feels strong, the bag can carry heavier fruits and vegetables as well. The bag has an appearance that indicates a fresh food product. After some time the bag gets softer because of moist from the mushrooms.



Type of mushrooms: All kind of mushrooms
Packaging material: PE
Functions packaging: Containment, convenience
Packaging features: Handles integrated in the bag.
Packaging experience: The material of the bag stretches significantly before tearing. The plastic does not feel sticky. The blue colour of the bag makes it difficult to see the mushrooms.



Type of mushrooms: All kind of mushrooms
Packaging material: PP
Functions packaging: Containment, presentation
Packaging features:
Packaging experience: The material of the bag stretches significantly before tearing. The transparency enables the consumer to see all the mushrooms. The plastic feels more smooth than the PE bag.

Packaging found through desk research



This product is a kit to grown your own mushrooms from the box (Back to the roots, n.d.). The packaging is made of cardboard, and it has a lever for convenience for the consumer. It also has the ability to open the front of the packaging to grow the mushrooms out of. The mushrooms have to grow, which means the packaging has a longer useful life time, compared to ready to eat pre-packaged mushroom packaging.

In appendix VII B, more mushroom packaging found through desk research are presented.



This packaging is made of recycled paper pulp, which absorbs the moist of the mushrooms to extend shelf life (Thijssen, 2017). This packaging is designed to reduce food waste by securing the quality of the mushrooms for a longer period of time.



This packaging is designed to extend the shelf life of mushrooms, this is done by a packaging which lets the air in and out more slowly than conventional mushroom packaging (Arnaud, 2015).



This mushroom packaging is made of cardboard ((Banken Champignons B.V., n.d.-c). It has a lever to hold the packaging, and it has the appearance of packaging fresh mushrooms.



The packaging is made of kraft paper with a printed wooden structure on it to communicate an organic touch (Stepfive Communication, 2018). This packaging was designed also for branding, which can be seen by the visuals on the packaging. The packaging is designed to communicate the fresh and healthfulness of the mushrooms (Stepfive Communication, 2018).



This packaging is made of wood, like the cardboard packaging a natural fibre material (Banken Champignons B.V. B.V., n.d.-c). The packaging has a lever, and because of the material the packing looks more valuable. Wood makes the mushrooms inside look like fresh.

VIII Evaluation test

A Actions and interview answers

Participant 1

Gender: Woman

Age: 24

Occupation: Student

Place: Technical University Delft

Use test:

- Grabbing from a box from 30 cm of the ground

The participant takes the packaging from the box. She clamps the green cylindrical shape between her thumb and index finger. She says that she has small hands, which is why she cannot grab the complete packaging from above.

- Opening the packaging

She opens the packaging on the overhanging round lid. The overhanging part is a sign for her on where the packaging is opened. She expects the lid to remain open when pulled up.

- Filling the packaging

She stills holds the packaging by clamping the cylindrical part.

- Closing the packaging

With the other hand, she closes the packaging on the overhang round lid.

Interview questions participant 1

- Why did you hold the packaging as you did?

Small hands so she could not take the packaging with one hand. The shape of the parts informed her on where to grab the packaging. Also, on where to open it.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

She thinks it's handy to hold the packaging on the cylindrical part. It could be more convenient if the cylindrical part was bigger.

- Why do you think the green colours are used on the packaging?

The colour is applied because it looks pretty.

- Do you think it is a convenient reusable packaging? And why?

If it can be placed inside the dishwasher, then it would be convenient as reusable packaging.

Participant 2

Gender: Man

Age: 25

Occupation: Student

Place: Technical University Delft

Use test:

- Grabbing from a box from 30 cm of the ground

He grabs the packaging from the front side of the packaging. He clamps the packaging horizontal in his hand, with his thumb on one side and his other fingers on the other side.

- Opening the packaging

Before opening the packaging he doubts on how to hold the packaging and decides to hold the packaging with his thumb on the green triangle part and his other fingers supporting the underside of the basket. He opens the packaging on the overhanging lid with two fingers of his other hand. (Thumb and index finger)

- Filling the packaging

He continues to hold the packaging with his thumb on the green triangle part and his other fingers supporting the underside of the packaging.

- Closing the packaging

The packaging is closed by grabbing the sides of the lid with his hand.

Interview questions participant 1

- Why did you hold the packaging as you did?

The diagonal shape where the lid is attached to the green part made him think that it should be held there. He said that he was not thinking or looking at the colours when grabbing the packaging from the box, grabbing the complete packaging seemed most convenient.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

No, because it is too small.

- Why do you think the green colours are used on the packaging?

As use-cue. The triangle and cylindrical part show where to hold the packaging and the shape of the lid shows were to open it, the overhanging part.

- Do you think it is a convenient reusable packaging? And why?

Yes, but cleaning may be difficult because it has overhanging parts.

Participant 3

Gender: Man

Age: 26

Occupation: Student

Place: Technical University Delft

Use test:

- Grabbing from a box from 30 cm of the ground

He grabs the box and puts it in two hands, and observes the packaging. Then says that he thinks it should be held with the thumb on the green triangle part and the bottom of the cylindrical part on top of his index finger.

- Opening the packaging

He opens the lid on the overhanging part with two fingers. He says the shape gives away where to open the packaging.

- Filling the packaging

He continues to hold the packaging with his thumb on the green triangle part and the bottom of the cylindrical part on his index finger. He says that he thinks that with more weight in the packaging it is less comfortable to hold the packaging like that.

- Closing the packaging

He closes the lid by grabbing the edges of the lid with his thumb on one side and his other fingers on the other side of the lid.

Interview questions participant 1

- Why did you hold the packaging as you did?

The diagonal part shows how it is opened and then the thumb on the green triangle part is the only part that doesn't open. When holding on the edge if the packaging is opened, it would fall on top of your fingers. The cylindrical part looked like a designed handle he said, this is why he grabbed it there.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

He said it makes sense to hold it there, but it should be made bigger to make it more convenient. If the packaging is filled it would be more difficult to hold it at that part.

- Why do you think the green colours are used on the packaging?

As use-cue, the shape of the lid showed were to open the packaging. The shape and colour showed him where to hold the packaging while filling it. Also, because it opens diagonal.

- Do you think it is a convenient reusable packaging? And why?

Yes, but bigger packaging sizes would be handy he thinks.

Participant 3

Gender: Man

Age: 26

Occupation: Student

Place: Technical University Delft

Use test:

- Grabbing from a box from 30 cm of the ground

He grabs the box and puts it in two hands, and observes the packaging. Then says that he thinks it should be held with the thumb on the green triangle part and the bottom of the cylindrical part on top of his index finger.

- Opening the packaging

He opens the lid on the overhanging part with two fingers. He says the shape gives away where to open the packaging.

- Filling the packaging

He continues to hold the packaging with his thumb on the green triangle part and the bottom of the cylindrical part on his index finger. He says that he thinks that with more weight in the packaging it is less comfortable to hold the packaging like that.

- Closing the packaging

He closes the lid by grabbing the edges of the lid with his thumb on one side and his other fingers on the other side of the lid.

Interview questions participant 1

- Why did you hold the packaging as you did?

The diagonal part shows how it is opened and then the thumb on the green triangle part is the only part that doesn't open. When holding on the edge if the packaging is opened, it would fall on top of your fingers. The cylindrical part looked like a designed handle he said, this is why he grabbed it there.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

He said it makes sense to hold it there, but it should be made bigger to make it more convenient. If the packaging is filled it would be more difficult to hold it at that part.

- Why do you think the green colours are used on the packaging?

As use-cue. The shape of the lid showed were to open the packaging. The shape and colour showed him where to hold the packaging while filling it. Also, because it opens diagonal.

- Do you think it is a convenient reusable packaging? And why?

Yes, but bigger packaging sizes would be handy he thinks.

Participant 4

Gender: Woman

Age: 55

Occupation: Housewife

Place: Dordrecht

Use test:

- Grabbing from a box from 30 cm of the ground
- She grabbed the packaging on the sides with two hands.

- Opening the packaging

She opens the packaging on the overhanging part of the lid, with multiple fingers. While opening she holds the packaging with her complete hand on the underside of the packaging. She says that the size of the packaging is convenient when holding the packaging on the underside.

- Filling the packaging

During filling one hand is still under the packaging, while with the other hand she grabs and fills the packaging.

- Closing the packaging

With closing the packaging she grabs the overhanging part of the lid with the hand with which she was filling the packaging first.

Interview questions participant 1

- Why did you hold the packaging as you did?

She said that she holds the packaging on the underside of the packaging because that felt stable.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

She did not think that is convenient, because it is small and therefore not stable to hold the packaging. She thinks that holding the packaging with her thumb on top of the triangle part and her other fingers below the packaging would be better.

- Why do you think the green colours are used on the packaging?

She thinks it is to make the packaging stand out and to make the packaging more pretty.

- Do you think it is a convenient reusable packaging? And why?

She thinks it is a convenient packaging because it eliminates single-use packaging. The size of the packaging was handy to be able to keep it in one hand. She asked if it could be cleaned in the dishwasher because that would be convenient.

Participant 5

Gender: Man

Age: 23

Place: Technical University Delft

Use test:

- Grabbing from a box from 30 cm of the ground

He grabbed the packaging with one hand from the front. He clamped to sides of the packaging between his thumb and other fingers.

- Opening the packaging

Before opening the lid he grabbed the cylindrical part of the packaging, but then he said this does not feel handy. Then he placed his thumb on the green triangle part of the packaging and his other fingers on the underside of the packaging. He opened the lid of the packaging at the overhanging part of the lid, he said that the overhanging shape is a sign for him that the lid can be opened there.

- Filling the packaging

During filling the packaging is hold with his thumb on the green triangle part and his other fingers on the underside of the packaging. He adds that the packaging can also be held on the front by clamping the sides of the packaging in his hand.

- Closing the packaging

He closes the packaging by taking the overhanging part of the lid.

Interview questions participant 1

- Why did you hold the packaging as you did?

He said that his first reaction was to just grab the packaging. Then when observing the packaging he saw that the lid opens diagonal and then he also started to understand why certain parts are coloured. He said that he was experimenting with how to hold the packaging.

- Do you think it is convenient to hold the packaging at the cylindrical body at the corner of the packaging?

No, because it is too small.

- Why do you think the green colours are used on the packaging?

He said, to make the packaging stand out and to indicate how it can be held. He added that the green triangle part made him doubt how to hold the packaging, which is why he started to experiment with how to hold the packaging.

- Do you think it is a convenient reusable packaging? And why?

Yes, he thinks it is. But he asked if it is convenient to be cleaned after usage.

IX Project Brief

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

! USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according to the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name
initials
student number
street & no.
zipcode & city
country
phone
email

Your master programme (only select the options that apply to you):

IDE master(s): IPD Dfl SPD

2nd non-IDE master: _____

individual programme: - - - - (give date of approval)

honours programme: Honours Programme Master

specialisation / annotation: Medisign

Tech. in Sustainable Design

Entrepreneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair Balkenende, R. dept. / section: Circulair Product Design
 ** mentor M.Sypesteyn M.Sc dept. / section: Human Information
 2nd mentor Jens Luiten dept. / section: Communication Design
 organisation: Kordaat Product Design
 city: The Hague country: The Netherlands

comments (optional)
:
:
:

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

! Second mentor only applies in case the assignment is hosted by an external organisation.

! Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair _____ date ____ - ____ - ____ signature _____

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

YES all 1st year master courses passed

Of which, taking the conditional requirements into account, can be part of the exam programme _____ EC

NO missing 1st year master courses are:

List of electives obtained before the third semester without approval of the BoE

name _____ date ____ - ____ - ____ signature _____

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: APPROVED NOT APPROVED

Procedure: APPROVED NOT APPROVED

comments

name _____ date ____ - ____ - ____ signature _____

Creating a packaging solution for the fresh fruit and vegetable industry. _____ project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date ____ - ____ - ____ end date ____ - ____ - ____

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Everyday people eat fruit and vegetables (F&V), which are mostly bought in the supermarket. These stores need to meet the demand of the customers, but unfortunately there is a disbalance in the demand and supply of fruits and vegetables. These products bring a lot of waste, in a way that food is thrown away but also a lot of plastics. Most F&V are packaged in a cardboard or plastic, which is a hazard for the environment. Plastics and cardboard in the amount that are thrown away are problematic to recycle. A way to counter the waste problem that the F&V industry causes needs to be created. In image 1 a simplified chart is shown of the main stakeholders involved in the F&V industry, in this chart the waste per stakeholder is made visible. Every stakeholder brings waste, but all in different amounts. The End of Life treatments of the produced waste of the stakeholders are shown in the image as well.

Fruit and Vegetable grower: This person grows the vegetables, which are sold to a wholesaler. The vegetable grower is dependant on demand of the wholesaler and the amount of F&V grown. Sometimes the grower sells directly to the stores and market. The waste produced by this stakeholder will mostly be fruit and vegetables. This stakeholder values a great harvest and high demand of the wholesaler.

Wholesaler: The wholesaler demands vegetables from the vegetable grower and sells it directly to fruits and vegetables sellers and supermarkets. The wholesaler also takes care of packaging the food, and thereby has packaging as F&V waste.

Package industry: The package industry takes care of producing packaging for fruits and vegetables. Currently most of the packages are made of plastics and cardboard. Innovations are being made in the package industry of F&V with more green packages of which some are already available in the stores. The packaging industry values a long term solution for green packaging that keeps their customers satisfied, because the supermarkets are becoming more aware of green packaging as well and so are their customers.

Supermarket: The supermarket gets his fruits and vegetables from the wholesaler. The fruits and vegetables are sold with and without packages to the consumer. Partly the supply of the supermarket is dependant on the consumer(person who buys the F&V to eat), which indirectly influence the demand and supply of the wholesaler and the grower. The stores will have waste due to transport and ruined or expired products. The supermarkets want to satisfy their consumers, this means keeping up to date with products and trends. They value new products and ecological products that keep their consumer satisfied.

Consumer: This person buys the fruits and vegetables from the supermarket and consumes the bought products. The consumer deals with the package in away of taking it of the F&V before throwing it away in the garbage bin. When F&V are not wrapped or packaged in the supermarket, it is likely that a plastic bag is offered to protect and transport the products. The consumer values good quality products with an acceptable price. The awareness of waste is growing among people, so more and more people value products with ecological packages.

Disposal company: This stakeholder takes care of the disposal of plastics and green waste of the consumer, but also from other parties like the stores and the wholesaler and the packaging industry. Which stakeholder bringst the most waste needs to be investigated. The ideal situation is to recycle all the waste, but this is not possible. The amount of waste is to big for the disposal capacity of europe. The disposal company would value packages that are easy to recycle.

Food is a precious industry with certain rules concerning hygiene and quality. The opportunity in creating a solution for the waste problem I will be focussing on is creating a new long term packaging solution. Steps in creating a new packaging solution are defining what a package is and discovering what the consumer expects from a package. By starting with the consumer a solution for more green packaging can be created, that is embraced by the consumer and convinces people to go for a more green product. This project will be consumer based, which means that a more elaborated research will be done into this stakeholder. Another challenge lies in the used materials. The project will have an elaborated material analyses to come up with an innovative solution in packaging of the fresh fruit and vegetable section. In the first weeks an research will be done to converge the project to a specific vegetable or specific kind of package, to which the complete project will be focussed.

The design agency with who this project will be done has multiple connections with growers, greeneries and packaging industries. These contacts will help to get a more elaborated view of the industry and the products that are in use and are being created at the moment. The agency wants to have a challenging project to see what is possible with packaging of fruit and vegetables. The end product of this project could be interesting for them and me to further develop into a product. This project will help them as well in gaining confidence of customers by showing their willingness in packaging projects.

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introduction (continued): space for images

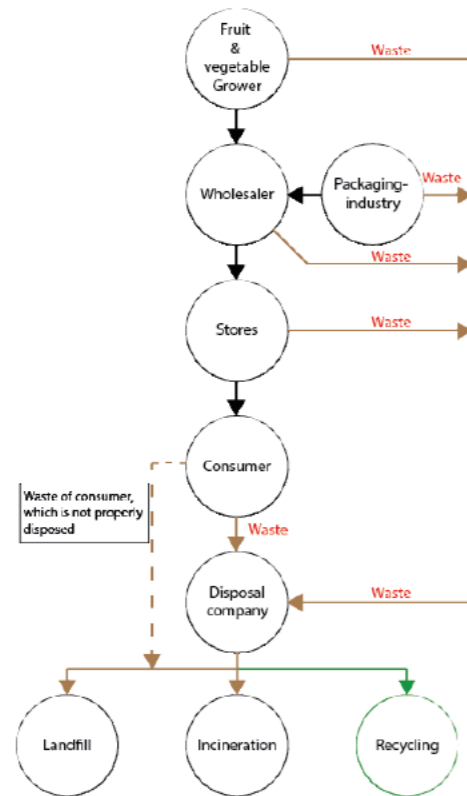


image / figure 1: Stakeholder chart with the flow of the produced waste

image / figure 2:

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

People are becoming more aware of waste and the effect it has on the environment. The F&V industry still uses a lot of plastics and virgin cardboard for packaging purposes, which have their pros and cons concerning the quality of the products and transport. The consumer buys the fresh fruit and vegetables pre-packaged or picks them from a crate and then takes a temporary package, usually a plastic bag is offered. Buying of fruit and vegetables packaged from the fresh fruit and vegetable section has become a habit. The main problem of all the packages is the amount of waste it produces. The consumer buys the product, which means they need to be convinced by the product to buy, use and dispose of it as intended. To conclude, the main problem is the amount of waste that is produced by the packages of fruit and vegetables and the effect it has on the environment. Also, the consumer needs to be convinced of the new sustainable packaging solution to move them to buy it and use it as intended.

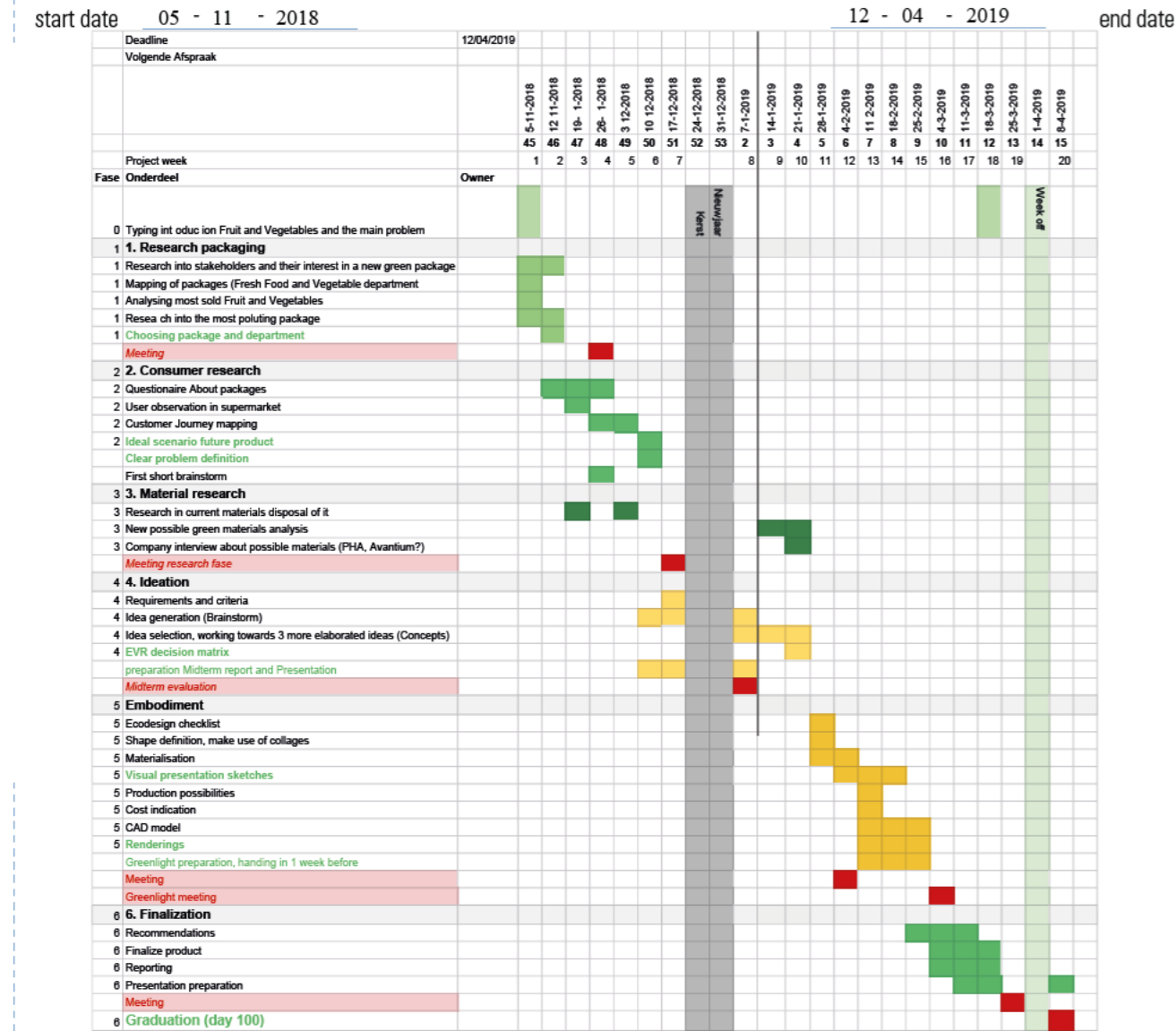
ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

In this project, I will identify which package of fruit and vegetable has currently the largest environmental impact, to use as the main subject throughout the report. I will design a new packaging solution, which complies with the needs and expectations from the consumer (the person who buys, eats and throws away the F&V and the package) of a packaging solution for fresh fruit and vegetables, the design of the packaging solution will also comply with the interest of the other stakeholders involved. This project will end in a design for a long-term packaging solution for a specific package of the fresh fruit and/ or vegetable section.

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.



1. research packaging. The first stage of the project starts with the identification of the most polluting package of all the fruit and vegetables of the fresh department in the supermarket. To do this first all kind of packages need to be mapped and information needs to be gathered about the packages itself and about the most sold fruit and vegetables. At the end of week 2, a decision must be taken about which package is most polluting and on which package the project will be based. **2. Consumer research.** This project is consumer based, which means that I want to discover how people see a package, what they expect of it and if they are aware of current innovations in packagings. To discover these answers a user observation will be done in the supermarket and questionnaires held. I think it is important for this product to have a customer journey map because the user goes through multiple stages with a package of a fruit or vegetable. In this part of the project, a research into the interest of a long-term sustainable packaging solution of the grower, greenery, transporter, and supermarket needs to be done as well. This project is focussed on the consumer (the person who buys the fruit and vegetables in the supermarket), but it is important to take the interest of the others stakeholders into account as well. At the end of this stage, an ideal scenario of the product will be made and a clear problem definition as well. **3. material research.** In the previous stages, market research of packages and consumer research is done, even a short brainstorm. In this stage, a material analysis will be done with the directions and ideas from previous stages in mind. Starting with the currently used materials and then moving to newly thought materials that could be used. I already got some advice to contact and to investigate materials from certain companies, which can be explored in this phase of the report. This stage will be ended with a meeting with both the chair as the mentor. **4. Ideation.** The ideation stage starts with organizing all the information into a list of requirements and criteria. After this, multiple brainstorm rounds will take place out of which the best ideas will be selected. The 3 best ideas will be made into more elaborated ideas. During this phase, the midterm report and presentation will be made and held. In this report and presentation I want to at least show some of the ideas. **5. Embodiment.** In the embodiment phase, one of the elaborated ideas will be embodied into a concept. First, the idea is checked with the ecodesign checklist and if time an ecodesign strategy wheel is made as well. The shape will be defined by the use of collages. Out of the material research, a material can be chosen and the production process discussed. In this phase multiple visual presentation sketches will be made as renderings. At the end of this phase, the greenlight meeting will be prepared and held. **6. Finalization.** The last week of the project will contain finalization of the designed product, the writing of the recommendations, finalizing of the report, and making the presentation. At project day 100 I hope to graduate.

Initials & Name N.C.P. Blaak Student number 4204190
 Title of Project Creating a packaging solution for the fresh fruit and vegetable industry.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, Stick to no more than five ambitions.

In the past years I have acquired knowledge to take on project with different kind of topics. A topic which I haven't explored yet is the Fruit and Vegetable industry. After reading in to this industry I found that it is full of possibilities and opportunities. In cooperation with 'Kordaat product design' we found a topic within this industry that is relevant and interesting. The advantage of working with this bureau is that they have experience with this industry and so they have the connections to get me introduced with the key stakeholders. In the past I did a project where I had to design a green package which was interesting and challenging, in this project I can reflect on what I learned and apply on the Food and Vegetable industry. In the master I followed a few visual communication courses, which I want to make use of in this project.

This project will be consumer focussed, this means that multiple test will be done to see what the consumer wants and expects. The goal and ambition of mine is to design a product that fits the needs and wants of the consumer.

The most interesting of this project is for me that is about an industry which I am not familiar with, this makes it a challenge and more interesting for me. The fruit and vegetable industry is a big part of the Netherlands trade in which I hope to make a recognisable contribution to make it more sustainable. Sustainable design is the future and I think combining this with the fruit and vegetable industry in this project will deliver interesting end creative results.

Learning ambitions

- At the end of the project I want to be able to successfully use the specific tools that are developed to create a sustainable product.
- I will be doing research into sustainable materials in this project. I want to get more familiar with these materials and also knowing the possibilities of them, this to be more efficient in future green projects.
- At the end of the project I want to have learned how to integrate my visual presentation skills in more parts of the creative process of creating to a product, this not only in making presentational drawings at the end of the project.
- I want to grow in my visual communications skills in a way that I can draw quickly and people understand the objective without having to read the text below it. This is something that I want to cooperate in the report of this project.
- This is project is consumer focussed, this means using tools to gather information from the consumer. I want to enhance my consumer research experience by using multiple tools and finding the tools that fit my way of thinking best. This to be more efficient in future projects.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name N.C.P. Blaak Student number 4204190
 Title of Project Creating a packaging solution for the fresh fruit and vegetable industry.