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thinking outside the fridge.

NEW APPROACHES TO THE CONSUMER-END OF THE FOOD SYSTEM

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Abstract

English

Agriculture - covering almost 40% of the world's ice-free area - has become one of the biggest contributors to global warming, mostly to feed the human population which covers only 2% of the world's surface.
One-third of the crops produced in these circumstances go to waste, while 10% of the human population continues to live in famine.
Studies regarding life cycle stages of food show that the consumer-end of the cycle, household and retail, are the primary causes of food waste responsible for almost 60% of the annual food waste. On top of the direct waste generated by the consumers, the contribution to the previous stages is not small enough to be negligible, especially regarding fruits and vegetables.
Among various reasons, the ones chosen to be the focus of this thesis are mainly the gap of information between the consumer-end and the production stage, followed by the lack of knowledge concerning correct storage of produce in households.
The goal of this thesis is to find possible remedies to this uneven and malfunctioning system through designing efficient and practical solutions, adapted to the kitchens of today.

Italiano

L'agricoltura - che occupa il 40% della superficie del pianeta non ricoperta dal ghiaccio - è diventata una delle maggiori cause del riscaldamento globale, principalmente per sfamare la popolazione umana, che occupa appena il 2% del pianeta.
Un terzo del raccolto prodotto in queste circostanze viene sprecato, mentre il 10% degli esseri umano continua a soffrire la fame.
Per capire meglio le ragioni di questo spreco, è stata condotta una ricerca sulle fasi e sui cicli di vita del cibo. I risultati dimostrano come le cause principali riguardino le abitudini dei consumatori e dei supermercati, che producono il 60% dello spreco di cibo annuo. Oltre allo spreco diretto generato dai consumatori, l'apporto agli stadi precedenti non è trascurabile, specialmente quello riguardante frutta e verdura.
Tra le varie ragioni, quelle prese in analisi in questa tesi sono principalmente il gap informativo tra i consumatori e la produzione e, secondariamente, la mancanza di consapevolezza sui metodi corretti per conservare i prodotti in ambito domestico.
L'obiettivo di questa tesi è quello di individuare rimedi attuabili a questo sistema malfunzionante e insostenibile, attraverso la progettazione di soluzioni pratiche ed efficienti applicate alle cucine moderne.

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Introduction

Starting from the beginning of Industrial Revolution, designers and engineers exploited all the resources offered by nature, forgetting any and all restraint, to achieve maximum production in the minimum amount time. Even though this economic revolution improved many current situations and increased the quality of life, in the end, it also helped to the creation of a consumerist society with the convenience of mass production. The more we had access to supplies, the more our level of appreciation dropped and we started to waste more than before.

In the book Cradle to Cradle, the authors describe what we call consumer as one who consumes very little and throws away the rest. But what does 'away' means? It certainly doesn't mean that the object disappears from existence just because we don't see them anymore; it all ends up in the landfill, heavy metals and chemicals polluting the soil and ending up in the groundwater.

According to the statistics of 'The World Bank,' the highest ratio (46%) of the overall waste is organic, which means food for humans and animals. Food waste releases 3.3 billion tons of greenhouse gases which are 40-60% methane and the rest divided between carbon dioxide, nitrogen, hydrogen, etc. 16% percent of the methane gas is released from the organic waste landfills trapping 100 times more heat than carbon dioxide in the atmosphere in 5 years.

Every year, 4 billion tonnes of food is getting produced. The division of this amount is: 36% goes to feed the livestock which later transforms into meat for humans, 9% is taken apart for biofuels or pet food. This 45% does not considered as waste, so to the human consumption what is left is 55% which corresponds to 2.2 billion tonnes of fruits, vegetables, and cereals.

According to FAO, one-third of this 2.2 billion tonnes goes to waste which is sums up to 88 million tonnes.

Agriculture is responsible for sending the 11% of the 88 million tonnes in the first stage. Meanwhile, to meet the accelerating demand for food, agriculture is also becoming one of the biggest contributors to global warming, emitting more greenhouse gas than cars and even than planes since the area needed for crops are supplied by deforestation, 70% of the world's water reserves are getting consumed by the crops, the fertilizers and pesticides harming the soil and the ecosystem.

After production, the stages are processing (19%), distribution (12%) and retail (5%) in which a total of 36% of the left 88 million tonnes of food gets dumped. In developing countries, this loss can be caused by the absence of basic services like unreliable transportation and storage, while in developed countries the reasons are the elimination made to appeal more to the eye of the customers, a selection made regarding the aesthetic criteria defined by the markets.

The final stages of the chain create the biggest portions of the food waste: the households (53%), which means the waste generated by consumers in their houses and food service (12%) which is the waste in the cafes, restaurants and every other place out of a home.

Considering all the facts, regardless in which stage, wasting food is an unaffordable luxury. The final stages, (restaurants, household, and retail) have a significant influence on the previous levels of the lifespan. Not only they affect the amount of waste in the agriculture and processing by deciding to eliminate

perfectly good food just because they look ugly, but also they mislead the calculations causing, fluctuation on the food systems thus leaving a critical part of the developing country citizens in hunger because the prices go higher than they can afford.

This year the food supplies of earth finished in 2nd of August, and we already started to consume the reserves of 2018. The scientists are worried about 2050 in which the world population will rise to 9 billion: There is enough space for people but not enough room for growing the food we will demand unless we stop wasting food. Even now, 850 million people, which corresponds to 10% of the total population of the world, are living in food insecurity.

Taking all this information into mind, this thesis will focus on two stages of life-span: household and retail. The subject will also be limited to the fresh vegetables and fruits since they are the base of all other alimentation without them, there can be no livestock or dairy.

Another important reason why these last two steps are chosen is because of their impact on the previous steps. The idea behind is that ,besides the technical problems, a major part of the food waste problem can be demolished with readjustments made in retail and household.

The first concern is how the fruits and vegetables are stored, which causes two to third of the household food waste. In developing countries, the feeling of comfort and security provided by the refrigerators leads buying more, stuffing the excess food out of sight inside the fridge also helps to forget them to rot. Also, it is another scientific fact that not all the vegetables and produces have to stay in refrigerators. Tomatoes, green leaves or eggplant are the most basic examples of vegetables that, if put inside the fridge, would get chill burns and lost their taste and rot more fastly. One other reason to put everything in the fridge is to make the kitchen space look more organized and neat. As a solution, new containers and new storage ways for fruits and vegetables which are supposed to be kept outside the fridge will be presented with the aim to include them to the decoration of the kitchen space.

The second one is the education of consumers. The most efficient way of achieving this passes through the supermarkets which everybody goes at least once a week and spends reasonable time. Instead of making demands to farmers about their products aesthetics, the supermarkets should dedicate their time, educating the clients about the origins of the products, in which conditions are they being produced and how should they be kept, stored and about the downsides of wasting food.

To sum up, the purpose of the project is by understanding the flow and influences in every step of food life-cycle, having an opportunity to re-think a new system to reduce food waste and its impacts. Most importantly, to focus on the possible ways to develop respect and appreciation towards edibles on the consumer-end, by learning through active and passive education, to finally convert the culture of 'throw more away' into 'mindful consumer.'

Methodology

1. THE RESEARCH

Literature view from;

Books
Academic articles
Online Articles& News
Documentaries &Videos

Survey ;

Between 100 people from ages in between 18-60 to see the general situation.

Informal Interviews;

With supermarket workers; To understand the reality of retail waste
Elderly members of the family; To learn how food was stored before refrigerators

Activities;

Volunteered with the group 'RECUP' to collect food from the local produce markets of Milan, Fridays on 'Via Termopoli'/ Mondays on 'Via Esterle' to understand the reality of the kilos of waste made from perfectly good vegetables and fruits every week.

The Simulations;

The kitchen light simulations made with;
- sketch-up video, according to the coordinates of Milano.

Kitchen Spatial Analysis made with;
- anthropometric data
-modelling of a prototype kitchen
- modelling of containers volume to simulate their space relations

1. Consumerism

'YOU MAY BE REFERRED TO AS A CONSUMER, BUT THERE IS A LITTLE THAT YOU ACTUALLY CONSUME, EVERYTHING ELSE IS DESIGNED FOR YOU TO THROW AWAY WHEN YOU ARE FINISHED WITH IT.'

William McDonough and Michael Braungart [1]

Before beginning the food waste or any kind of waste, first thing to understand is why there is so much waste and what is the history and happenings behind that made us come to this point?

The first step of creating waste is consuming. It is a natural behaviour which every living creature, animals, plants, insects, parasites, in order to sustain their life, need to consume some source of energy. In nature, the waste of an organism means food for another one, everything that is being used, then used by another organism, creating a pattern of comsumption in a closed circle. In modern civilizations, the circularity leaves its place to a linear system where waste becomes landfill and the act of consuming gains a negative significance. As the authors of the higly influencial book 'Craddle to Craddle' emphasize, it is wrong the term 'consumer', we are 'throw-awayers.'

The ideology of the action of systematical buying and throwing away is called 'Consumerism', which is explained as **'the theory that an increasing consumption of goods is economically desirable'.**

Our society's linear economy is founded and fed by the act of consuming; to survive, the system requires someone to buy, throw away and then buy more in order to sustain the flow of money in a self feeding loop. There is a visual and informational gap in between the consumer and the thrown away product, blocking the perception of the reality's gravity: What is thrown away is then out of sight, out of mind, most probably ending up in landfill with all the rest, releasing poisonous gasses to the atmosphere whilst decomposing, which can take up to millions of years.[2] We all must be more conscious regarding what we buy and what we throw away for the results will outlast our lifespans.

1 Mcdonough, W., Braungart, M. (2009). Craddle to Craddle. London: Vintage.
2 Morgan, A. (2015). True Cost (Motion documentary) United States: Life is My Movie Entertainment Company.

GROWTH OF CONSUMERISM

Even though the consumerist society shaped mainly after the industrial revolution, it traces back to the 16th century Elizabethan England where changes in consumption pattern begin to occur in a small section of the population, the noblemen.[1]

Queen Elizabeth had started to call the regional lords from all around the country to participate in a ceremonial court periodically to fortify her control over the society. This way she managed to put the noblemen in a competition of standing out in the crowd, trying to look more powerful and wealthy. By this way, the goods and the looks, from furniture to the ways of dining, gained another communicative value demonstrating the social status. Tradition left its place to fashion. To keep up with this style, the local money movement sustained by the commerce shifted to the fancy shops in London. Communities who were dependent on the spendings of noblemen and their families started to suffer, and the social gap between classes had expanded.

In the 18th century the situation kept getting worse, the more people got money, the more they invested on new goods, considering only the aesthetics, keeping or discarding them depending on fashion instead of their lifespan or function.

In the 19th century, with the opening of the first department store, the concept of shopping changed from necessity to a leisure activity. Until this point, the power to spend money on luxury goods was a privilege for only the wealthy households. After the department store openings, the harder to get goods, become more accessible and economically more affordable also for lower income levels. The stores were both architecturally and psychologically designed to appeal people to spend more and to have more.

These were the initial steps taken on the road to a consumerist society, but still, a vast majority of the population was not able to afford any of these luxuries. Instead, they were re-using the leftovers, in a way recycling the waste of rich people. The real mass consumption and the boom in goods started after the industrial revolution.

1 McCracken, G. (1990). Culture and Consumption: New Approaches to the Symbolic Character of Consumer Goods and Activities. Indiana: Indiana University Press
2 Spark, P. (2008). The Modern Interior. London: Reaktion Books.
3 Mcdonough, W., Braungart, M. (2009). Craddle to Craddle. London: Vintage.

Claude Monet // Les Charbonniers 1875

With the industrial revolution, the culture of mass production spread more and more. Now that nature is tameable, to limit transportation costs, the factories were built next to the forests or mines, polluting the rivers with discharges, natural sources were taken advantage brutally without respecting any limitations on the contrary as if on a vendetta.[1]

As described in the previous part, in addition to the local economies shifting to the cities and the development of new technologies and methods, the necessity of man force started to decrease, causing immigration to cities, in search for better conditions and work opportunities.

Consequently, the destruction was also made to humanity; Cities were chaotic and full of sickness, even children were working for low wages, families that were not able to afford housing or food. The criticism of misusage of the industrial work force was subjected to many artists such as Charles Dickens, Monet, William Turner and almost in every film of Charlie Chaplin. To afford the consumption and luxury of a small percentage of the population, the poor have to work day and night, in horrible conditions unable to even pay for food or other necessities.

1 Mcdonough, W., Braungart, M. (2009). Craddle to Craddle. London: Vintage.

The person who played a very decisive role in changing those circumstances was Henry Ford in 1910, his point of view was 'If you cut the wages, you just cut the number of your customers.' [1] So he paid his employees high enough to provide them the purchasing power to afford the cars they produce, the financial sources to become a member of the mass consuming society.

So the consumerist values of acquiring luxury goods and services to publicly display economic power which once was only afforded by a small part of society after Fordism and industrial boom spread to the lower levels of society.

The same systematic evolution also applied for the food systems and the mediators between people and food which is explained on the next part.

EFFECT ON FOOD SYSTEMS

Before the 1900s, groceries were purchased from local specialty shops focused on only one aspect like butcher, fishmonger, bakeries, vegetable stands or grocery stores which were selling canned products or dry items like seeds. People would travel them individually according to their needs and would be served by clerks who were responsible for gathering the products around the shop and handing out to the customer. Shopping was done daily since the fridge wasn't diffused in the everyday lives.
This system changed in 1916 when the first 'Piggly Wiggly' store has opened which introduced self-service grocery shopping to America. Instead of the clerk, they created the shopping aisles full of products and provided check-out stands. In this way, they managed to lower the cost of the goods. Customers now have given a chance to select among several products thus for the first time branding and packaging have started to gain importance. The independent grocery stores were either adapted or perished. Some of them even merged in order to become one big chain store.

In 1930, Michael Cullen who was a former employee of Kroger (another grocery chain) opened a new super store located in the suburbs of the town to take advantage of low rents. He proposed to invest 12% of the income to the advertisement. The developed highways and reduced cost of transportation opened up the way to create these huge warehouses with economic rents, no additional need for storage since there was enough space to hold larger inventories. The shoppers would come with their cars to these stores, would serve themselves from the shelves, buying in bulk and store in their refrigerators.

Although there were some restrictions throughout the years of World Wars, It is undeniable that the postwar era created a mirage for mass consumption.

1 Gabriel, Y., Lang T. (2015). The Unmanageable Consumer. New Delhi:SAGE Publications

2. Food Waste

'FOOD WASTE IS ESPECIALLY VISIBLE WHEN ITS PREVENTION IS BEING COUNSELLED.'[1]

SEEING THE PROBLEM

We can understand the major problems throughout history especially when we come across the attempts of a solution. If the publications touch upon a significant subject, in this case food waste and how to deal with leftover foods, it shows that there is a problem which needs advisory.

It is striking to see the search for a solution to the left over food problem in the cook books written in the mid-nineteenth century. The most famous example would be 'Mrs. Beeton's Book of Household Management' published by Isabella Beeton in 1861. The book was addressing the housewives and women, in general, giving information about how to conserve and store the food once it's brought to the house as well as recipes and advice for leftovers. Its motto was: 'Never waste or throw away anything that can be turned to account'. The abundance of these reference books, written on the subject until the beginnings of the twentieth century, is a proof of society's priorities and the importance given to the edibles.

Moreover, ideas about the value of preventing the food waste were also reflected in the graphic design and government propaganda posters. Specifically, during the war time, the US government called for avoiding food waste with its poster: " Food is Ammunition. Don't waste it'. By World War II, British propaganda posters emerged all around cities advising to save the kitchen leftovers for hens and pigs instead of throwing them away. Pigs can be fed with anything so converting waste to pig meat it is a perfect recycling method. Pig bins were also placed in the streets to encourage the public, and growing food in the backyards or empty lands were highly supported. The studies show that the generations who experienced World Wars, are more sensitive to the issue of waste and hardly waste food[1]. The scarcity of war times has obliged people to be more cautious about wasting; instead, adaptive reuse and up-cycling were promoted which had led to the creation of a more mindful generation.

1 Evans, D., Campbell, H., Murcott, A. (2013). Waste Matters: New Perspectives on Food and Society. Victoria : John Wiley & Sons.

2 Friese, S. (2000). Self-concept and identity in a consumer society: Aspects of symbolic product meaning. Marburg: Tectum 7-38.

POST-WAR ERA

Later on, in the post-war period with rising incomes, full employment and the spread of refrigerator ownership, the need to make the most of the leftovers mostly disappeared from the books and propaganda posters. The books are re-published extracting parts about waste and the ways to deal with it. The children of those growing up in the World Wars became increasingly used to feeling better off than their forebears.[1]
Unfortunately, the recklessness of the developed countries caused a global food crisis: With overpopulation and after the wars, changing dynamics in global food regimes have put the food security of several areas such as Asia and Western Europe under threat.

GREEN REVOLUTION

Trying to solve the famine and improve the situation of agriculture, in 1930, scientists, led by Norman Borlaug, initiated the 'green revolution.' In the late 1940s-50s with sets of relationships in between policy, technology, science and economics combined with the new production techniques and farming approaches such as: the high-yielding variety of seeds, which was genetically modified to produce more yields per hectare, expansion of irrigation systems, modernizing the techniques and machines, usage of synthetic fertilizers and pesticides, the revolution managed to save more than a billion people mostly living in developing countries and made food resources more accessible but at the same time resulted in a regime of excess food. [2]

Global food relations moved from scarcity to surplus as the farmers directed towards producing the maximum amount of food regardless the potential market. During the cold war, agriculture was a weapon of demonstrating the power of the country, so there was large scale corporate investment in the agricultural sector. It was a shift from scarcity to surplus and food become rapidly more cheap and abundant.
The prices were going cheaper, to maintain the profits high, innovations such as fast food chains, elaboration of branding and the supersizing of the food appeared. [3]

In this period, although on the increase, food waste phenomena were kept invisible as possible. The invisibility also supported and disregarded especially by corporations and empires of food with economic profits.

1. Evans, D., Campbell, H., Murcott, A. (2013). Waste Matters: New Perspectives on Food and Society. Victoria : John Wiley & Sons.
2 Friedmann, H. (1987). 'The Family Farm and the International Food Regimes'. In Peasants and Peasant Societies, Second edition, T.Shanin, ed., Oxford: Basil Blackwell, pp.247-58.
3 Levenstein, H. (1993). Paradox of Plenty: A Social History of Eating in Modern America. New York: Oxford University Press.

GLOBAL FOOD CRISIS

After this 'brief period'; around 50 years- quite short if considered through history- food waste became visible again in the 21st century.

In 2006-07, there was a temporary drop in food production growth, which demonstrated the fragility of our food system. World population has grown from 1.6 billion in 1900 to over 7.2 billion today, and the 4% decline in wheat production caused the global food crisis in 2008 causing political and economic instability and social unrest in both poor and developed nations caused civil wars and increased immigration.[1] According to the data of United Nations in 2007, there were 923 million people (907 million of them in developing nations) in the world living in food insecurity. The global food crisis caused the prices to go up 23% in 2007 and 54% in 2008 pushing another 44-100 million people to hunger.[2]

A recent research, done by Jonathan Foley, found out there is enough food produced in the world to feed all the population and even more. Hunger is caused by poverty and inequality, not scarcity.[3] The inaccuracy is not on production stage; it is in the distribution. Usage of grains for biofuel, to feed livestock can stretch the supplies easily, leaving millions in food insecurity and malnutrition. If the developed countries wasted less, there would be more available grains in the world market, making it more affordable for the people who are making less than $2 a day, most of whom are poor farmers cultivating small plots of land, can't afford to buy food.[4]

Fortunately, the governments started to take actions, besides laws on land-grabbing, biofuels and a pushing towards a more environmentally friendly agricultural system, there have been acts towards waste reducing and landfill management. The food waste scholarship and food waste politics has developed and strengthened, there are more sources of information and expertise on the subject and a lot of civil action and awareness. [5]

1 Klein, N. (2014). This changes everything: Capitalism vs The Climate. [Kindle Version]. From http://www.amazon.com/
2 Food and Agriculture Organization of the United Nations. (2017). FAOSTAT statistics database. [Rome] :FAO
3 Gimenez, E. H. (2012, May 02). We Already Grow Enough Food For 10 Billion People -- and Still Can't End Hunger. Retrieved September 14, 2017, from http://www.huffingtonpost.com/eric-holt-gimenez/world-hunger_b_1463429.html
4-5 Stuart, T. (2009). Waste: Undercovering the Global Food Scandal. [Kindle Version]. Retrieved from http://www.amazon.com/

ENVIRONMENTAL EFFECTS

Another side effect of food waste, relatively invisible to the governments and consumers since the economy, is what are more concerned about, is the environmental side-effects. We are creating ecological and social disasters to feed the human populations, forests and ecologically valuable lands which are the houses of many endangered animal species are being turned into agricultural land because developing countries create a falsification by buying 25% more than what they need, to throw them in the garbage.[1]

Additionally, relatively invisible is the released 3.3 billion tons of greenhouse gases yearly: 40-60% of the landfill gases consists of Methane and the rest divided between carbon dioxide, nitrogen, hydrogen, etc. This gas has a global warming potential 21 times greater than carbon dioxide and traps 100 times more heat in the atmosphere in 5 years. 16% of the methane is released from the organic waste which consists of the food we throw out. The organic matters trapped without oxygen creates the excellent conditions for the methane producing microbes. They will keep emitting methane, continuing to decompose for years. [2] As Frank Ackerman wrote in his 1997 published book, some developing countries are already running out of space to bury their rubbish.

Also, agricultural areas, especially livestock farming emits 90 million tonnes which are 27% of total methane release since the animals create large amounts of gas during their digestion period.
However recent studies show that, methane is the source of one of the most environmentally beneficial biofuels. It can be captured from landfills to be burned to produce green energy.[3]

TEMPORARY ASPIRATIONS

In the 21st century society, the consumerism has shaped and developed, with advertisements and endless choices changing every day, even though we have everything we are constantly being triggered to want more.

Depending on one's dreams and desires, there is a tendency to give meanings to objects, even assign them characters and when the person buys this object of desire, believes to become the character he/she created or being closer to the desire.[4]

Campbell also explains this state of being as **'the inexhaustibility of wants, lies in the inevitable gap between the perfected pleasures of the dream and the imperfect joys of reality.'** So when we acquire an object that we relate to our desire and make a dream come true, we immediately start searching for another desire after we achieve one. The previous object of desire slowly loses its importance, getting thrown away or forgotten. Consequently, the pile of 'things' thrown away increases, prompt by the changes in fashion and branding.

With the income of the major part of the population high enough to cover the luxury goods with deduced prices with the mass production, running from one dream object to another, it is inevitable that food the more got accessible, the more lost its maximum initial value.

While food waste was becoming an invisible issue, the high levels of perfection in the appearance of food, especially of vegetables and fruits, gained tremendous importance. If the fresh look cannot be achieved with the perfect looking of produces, in the supermarket, the customer doesn't feel satisfied.

The consumers seek of variations or new experiences and disliking of eating the same meal or leftover food, are several reasons for food waste created with the culture of consumerism.[1]

SUMMARY

This chapters primary aim is to describe and try to find a response to the question: Why food waste exists?
With a general overview of the historical flow of events starting from the Victorian England to today the growth of consumerism and how it spread to all levels of society with the innovations of Industrial Revolution, followed by grocery stores giving their place to the supermarkets and cellars to refrigerators.
How the pattern of importance given to food changes, according to the daily habits, from being invisible to a symbol of power in war time.

Deriving from the research, in our modern world food waste unfortunately only exists to the people who have the money to afford to waste. There is not enough connection between the people in the city and the farms and since the food keeps coming by any means, nobody questions the facts or background we simply take whats given for granted. Coming from this, in the next chapters, the food waste throughout the life cycle of the food will be analysed to understand better the actors, reasons, and consequences of food waste and how can we enhance the weaknesses.

1-3 Stuart, T. (2009). Waste: Undercovering the Global Food Scandal. [Kindle Version]. Retrieved from http://www.amazon.com/

4 Main sources of methane emissions. (2017, July 08). Retrieved September 14, 2017, from https://whatsyourimpact.org/greenhouse-gases/methane-emissions

5 Botton, A. (2007). The Architecture of Happiness. London: Penguin.

1 Aschemann-Witzel, J.; Hooge, D.; Normann, A. (2016) Consumer-Related Food Waste: Role of Food Marketing and Retailers and Potential for Action. Journal of International Food & Agribusiness Marketing Vol. 28 , Iss. 3.

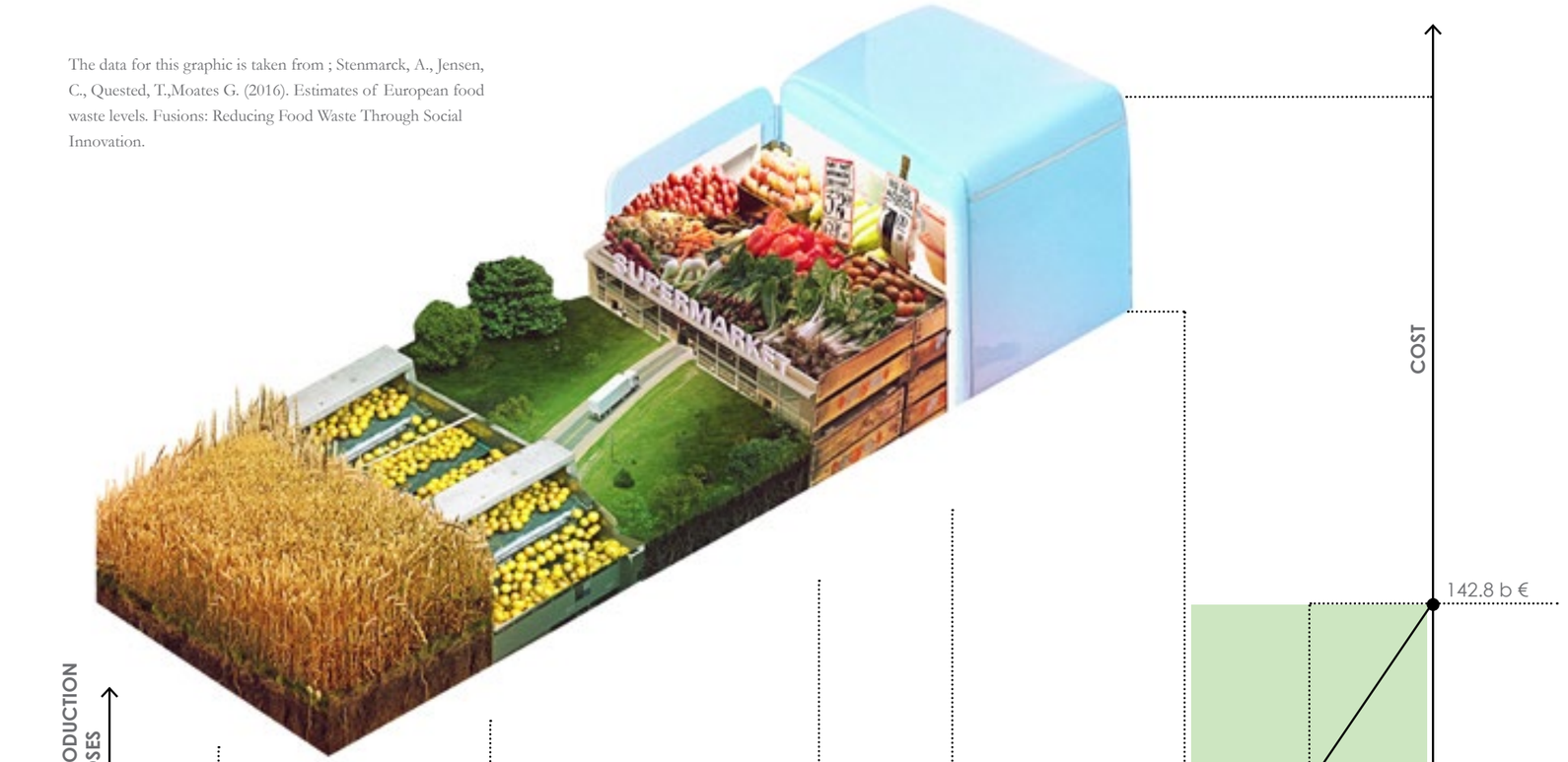
PHOTOGRAPH BY GEORGE STEINMETZ, NATIONAL GEOGRAPHIC CREATIVE
Mato Grosso region of the Brazilian Amazon,sections of rainforest are burned to make way for farmland to grow corn and soybeans.

3

FOOD WASTE IN THE LIFE CYCLE STAGES

photo taken from http://aboutfoodwaste.peatix.com

The data for this graphic is taken from ; Stenmarck, A., Jensen, C., Quested, T.,Moates G. (2016). Estimates of European food waste levels. Fusions: Reducing Food Waste Through Social Innovation.



MT ; million tonnes

In this chapter, the food waste will be examined throughout each step of the lifecycle. Depending on the data given by United Nations, In total, annually 2.12 billion tonnes of waste is generated, and 46% of this amount is organic waste, including food, wood, leaves, etc.[1]
At the same time, from the **4 billion tonnes of food that gets produced every year, 1.3 billion tonnes, about a third of all, go to the garbage:** 45% fruit and vegetables, 35% of fish and seafood, 30% of cereals, 20% of dairy products and 20% of meat.[2]
Taking this percentage as a starting point, the primary focus of the study has thought to be the waste of fruits and vegetables since;

1. Agriculture is the point that binds almost all the food chain; without the production of fruits, vegetables, there can be no thinking of livestock production, without livestock there is also no possibility to produce dairy products such as milk or cheese.
2.The surface area covered by agriculture is 36% of all the world livable area which is quite large.
3. The percentage is the largest of all the categories, although they are relatively more affordable, their perception of produces are underestimated.

The graphic on the left shows an overview of total food waste produced in the different stages of the life cycle, calculated in weight and cost which will be discussed more detailed on the following pages, are;

1. Production (agriculture and harvesting),
2. Processing and Distribution
3. Retail and Wholesale
4. Food Service (food which is eaten outside of the household)
5. Household.

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1 Hoornweg, D. and Bhada-Tata, P. (2012) What A Waste : A Global Review of Solid Waste Management. Urban Development & Local Government Unit, World Bank. - Urban Development Series Knowledge Papers 15.

2 Food and Agriculture Organization of the United Nations. (2017). FAOSTAT statistics database. [Rome] :FAO

3.1 Agriculture

THE WORLD POPULATION MAP[1]
Yellow dots showing people

THE WORLD AGRICULTURE MAP[2]
From brown to green showing pastureland to cropland

The two maps above: the one on top is the map of the human population taken from NASA's website, and the bottom one shows the agricultural land usage for cropland to livestock farming, taken from a part of Jonathan Foley's experiment about feeding the world in 2050 published in National Geographic.

According to the map of Nasa made in 2016, the yellow colored part represents the half of the global population which is living in dense cities, the other half of the population, on the other hand, spread in the black part of the map in a more sparse way. The yellow part covers only 1% of the surface area of the world's total livable land, so in total it is possible to say human cover approximately 2% of the worlds surface area.

Then we look at the second map, the agricultural land usage to feed the 2%. The map shows a total of 38.6 % of the whole world's ice free-land is used for pastureland to cropland to sustain the accelerating demand for food and every day this percentage gets wider to open new fields.

Agriculture is becoming one of the biggest contributors to global warming, emitting more greenhouse gases than cars and even than planes, 70% of the world's water reserves are getting consumed by the crops and the fertilizers and pesticides harming the soil and the ecosystem.

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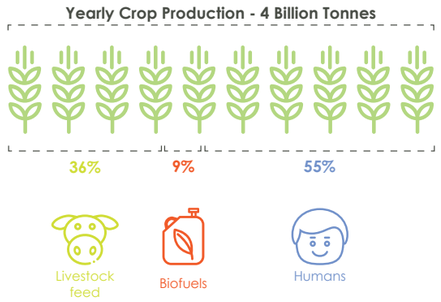
1 NASA Socioeconomic Data and Applications Center

2 J. F. (n.d.). A Five-Step Plan to Feed the World. Retrieved September 14, 2017, from http://www.nationalgeographic.com/foodfeatures/feeding-9-billion/

CROP DISTRIBUTION



In these conditions, not in an eco-friendly way, big agriculture companies and individual farmers. **produces 4 billion tons of food yearly.** From this amount first: 36% becomes animal feed, and 9% of it is used for non-food chains such as biofuels or pet food. This 45% is not considered as waste. From the remaining 55% of the first production, 11% which corresponds to a total of 9 million tons of crops go to waste during the first stage of the life cycle[1].

Among the reasons, there are:[2]

- To guarantee themselves against pests and weather, farmers often plant more than consumers demand or in an unstable economy, a farmer grows more than the market demands, then leaves entire fields and orchards unharvested.
- Food may not be harvested and left in the fields because of damage by weather, pests, and disease.
- If the price of produce on the market is lower than the cost of transportation and labor, sometimes farmers choose to leave their crops unharvested.
- If the products that do not meet size, shelf life, or other criteria imposed by retailers because of the high aesthetic demands of the customers, the retailers reject to buy the products.

EFFECTS OF THE OTHER STAGES

Besides the natural causes of loss like pests or disasters, the impact of subsequent stages on agricultural waste is undeniable especially the consumer's choices act a very distinctive role in all the stages of food life cycle.
The supermarket waste is stated as 5% but how about the effects of supermarkets restrictions on the agriculture and processing steps.

1 Stenmarck, A., Jensen, C., Quested, T.,Moates G.(2016). Estimates of European food waste levels. Fusions: Reducing Food Waste Through Social Innovation.

2 Gunders, D. (2012) Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. The Natural Resources Defense Council Issue Paper.

According to a study by a waste company Biffa, estimates that a third to a half of British fruit and vegetables are grown for supermarkets are rejected, largely because of the tight specifications regarding size, blemishes, and appearance.

Tristram Stuart, who is a highly influential writer and researcher about the food waste issue, visited several British farms to understand how quality standards affect the level of food waste. At the farm, the author was shown large quantities of out-graded carrots, which, having a slight bend, were sent off as animal feed. In the packing house, all carrots passed through photographic sensor machines, searching for aesthetic defects. Carrots that were not bright orange, had a blend or blemish or were broken were swept off into a livestock feed container. As staff at the farm put it: "Asda (The supermarket's name) insists that all carrots should be straight so that customers can peel the full length in one easy stroke." In total, 25-30% of all carrots handled by this carrot company were out-graded. About half of these were rejected due to physical or aesthetic defects, such as being the wrong shape or size; being broken or having a cleft or a blemish."[1]
All around the world because of the high standards, farmers are forced to trash up to 50% of their harvest just because it doesn't look "right so instead of losing in later stages which costs more; farmers prefer not to harvest, large portions of crops never leave the farms. Some rejected crops are used as animal feed with less profit showing that the quality standards might divert food initially aimed for human consumption to other purposes.

Modern farming innovations have increased the potential to produce vegetables and fruits but at the same time, introduce standards based on subjective aesthetic values, besides the nutrition or taste. These strict qualifications are caused by the consumer's choices made by evaluating the appearance. The main reason for this misunderstanding is the lack of connection between the primary and the final step of lifespan which is a subject to work on and needs development.

1 Stuart, T. (2009). Waste: Undercovering the Global Food Scandal. [Kindle Version]. Retrieved from http://www.amazon.com/

2 Photo taken from thisismold.com

3.2 Processing // Distribution

After the agriculture, the next step is preparation and distribution of the product to retail. In this stage the total of lost is 19% of the total which corresponds to 17 million tonnes of food.

PROCESSING

Once crops have been harvested, culling is the primary reasons for losses of fresh produce. Culling is the removal of products based on quality or appearance criteria, including specifications for size, color, weight, blemish level. Some off-grade products.

A percentage of the produce that is not of a quality grade to sell to major markets go to processing. Most large processors have advance contracts with suppliers and often require specific attributes that make the product amenable to processing.

In addition, even if a processing facility is willing to accept products that might otherwise be discarded, the location must be close enough to justify transport costs, and the facility must have the capacity to process the product. This can be particularly challenging for small and medium size farmers. Much off-grade produce also goes to animal feed.

Loss from improper storage or handling although decreased, can still be significant most commonly, in the case of the market which was agreed before, does not accept the fresh produce because of various reasons, if a new buyer cannot be found quickly enought, the food can spoil in storage[1].

Overproduction, product and packaging damage and technical malfunctions can also cause processing losses, though these may be difficult to avoid.

The pre-cut produce or other packaged, fresh, ready-to-eat food getting prepared at this stage, helps to make the slightly damaged product marketable and usable through trimming. But once a produce is peeled, the life span shortens so in the case of not being used immediately sold; this produce gets wasted, in this case also adding the transportation footprint, composting the produce or turning into animal feed has lower impacts on the environment.

1. Gunders, D. (2012) Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. The Natural Resources Defense Council Issue Paper.

DISTRIBUTION

Proper transport and handling of food are critical throughout the supply chain, particularly with perishable goods that require cold conditions. Inconsistent refrigeration is less of a problem today than in the past, but it still occurs when trucks malfunction are involved in accidents.
Other handling problems happen when produce is kept at improper temperatures, such as when it stays too long on loading docks. Imported products can wait days at the ports for testing, significantly reducing their shelf life. Also in this case, if the shipment is rejected, it may be difficult to sell before spoiling since a lot of time already passed.

This stage of losses is more common in developing, low-income countries because of the lack of facilities and services, the delivery trucks incapable of providing optimal conditions (in a case of breakdown or accident also).

Both of these stages, besides the technical deficiencies, a significant part of the waste is again consumer related. The product that has been through a very strict elimination after being harvested goes through another scanning in this stage to check if there are any other deficiencies overlooked.

At these stages, the cost of wasting the products, especially after the distribution, gets higher. All the energy and resources that go into making it has already been spent. It is worse than the agricultural waste that can be collected by gleaners or sent to compost. Since there is also packaging involved, the disposal of the items become a larger problem.

After the initial production and preperation stages, we move on to retail and household which should be focused more since it is more influencial on all the primary stages.

1. photo:(n.d.). Retrieved from http://home.turatti.com/wp-content/uploads/2016/06/slide_foodprocessing-1.jpg?x35064

3.3 Retail / SUPERMARKETS

The third step of lifespan is the retail and supermarkets. They are located close to the end of the supply chain and also collect large quantities of food in a limited number of physical locations. [1]

The ratio of food waste in supermarkets is relatively small in comparison with other stages in the food supply chain which according to the EU FUSIONS report, supermarkets and retail stage waste is stated as **5% of the overall waste.** Although the waste got created at the end of retail might look like only 5%, the super market workers in a supermarket in US says: **"One in seven truckloads of perishables delivered to supermarkets is thrown away."**[2].This reality of vagueness is also highlighted in the Fusions Report, is very variable depending on the size of the market or the company policies. Also when calculating the retail waste percentage, the effect on previous stages are never considered in any of the reports regarding the calculations. Many of the markets send the agricultural product back at the end of the day when they are not sold; these are never considered as retail waste. Again the influence on the aesthetics of the produce constitutes one-third (in some cases half) of the agricultural and processing stages.

Even though stated 5% of total waste, the cost of waste, annually, goes up to 24.8 billion euros whereas, the step before (processing and distribution) though covering 19% costs remains at 14.8 billion euros. Waste represents more loss of value, going towards the end of the chain when more subprocesses have executed for nothing.[3] The enormity of the difference between these costs also demonstrates the inequalities in the food system in terms of labor/sales distribution.

In addition to the economical sides, in every step of the food supply chain, passing through subprocesses like transportation and packaging, waste represents the loss of more energy and more carbon emission so the environmental impacts are also higher.

Recent studies of food waste in supermarkets, mostly focus on describing the quantity of waste, problems causing it and how it could be given to charity in order to avoid it.[4] Although donating seems like a conscious and a just act, the amount that is given is not enough. The datas show that charities have access to only 2% of the supermarkets' available food surplus. Sainsbury's, a supermarket in UK, has donated 7% of their surplus, nearly 3,000 tonnes of food last year. The waste sent to anaerobic digestion was 9 times more meaning turning waste into fuel and fertiliser has chosen over the oppurtunity of actually feeding people. Therefore, waste prevention and waste valorisation measures, and the potential to reduce the environmental, social and economic impacts related to food waste need reconsidered and renewed in a more human-friendly way.

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1 Eriksson, M. (2015) Supermarket food waste: Prevention and management with the focus on reduced waste for reduced carbon footprint. Uppsala : SLU Service/Repro

2 Gunders, D. (2012) Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. The Natural Resources Defense Council Issue Paper.

3 Gustavsson, J.,Stage, J. (2011). Retail Waste of Horticultural Products in Sweden. Resources, Conservation, Recycling 55

4 Stuart, T. (2017, February 03). Supermarkets should be cutting food waste, not relying on charities. Retrieved July 28, 2017, from https://www.theguardian.com/sustainable-business/2017/feb/03/supermarkets-food-waste-charities-tesco-sainsburys-fairshare

The Main Reasons of Waste in Supermarkets

Before Retail

AGRICULTURE// PROCESSING/DISTRIBUTION

MARKET CONDITIONS // A crop's price at time of harvest may not warrant the labor and transport costs required to bring the product to market.

BUYER QUALITY STANDARDS // Aesthetic requirements imposed by the market lead to nonharvest and culling of edible produce upstream.

During Retail

MARKETING STRATEGIES

PLACEMENT // Most grocery stores operate under the assumption that customers are more likely to buy produce if it's from a fully stocked display. This assumption leads to overstocking, as well as damage to items on the bottom of those perfectly constructed produce pyramids.

DAMAGED GOODS, OUTDATED PROMOTIONAL ITEMS, AND UNPOPULAR ITEMS // Often, product packaging gets damaged during shipping, leading supermarkets to toss products even though the food hasn't been compromised. In addition, items that fail to sell like overstocked holiday foods or unpopular new items are often tossed.

CUSTOMER ASPECT

SELL-BY DATES // Most consumers have no idea what expiration dates, sell-by dates, use-by dates, or best-by dates mean. Consumers (and many sellers) wrongly assume that food is no longer good after these days. Instead, sell-by dates are guidelines for sellers to indicate peak freshness. Most foods are good long after the sell-by date. Fearing consumers will either not buy the food or think the stores are carrying old products, most grocery stores pull the items out of stock several days before the sell-by date.

EXPECTATION OF COSMETIC PERFECTION // Customers have been used to expect perfect, identically shaped produce. Retailers stock their produce according to that expectation, even if the shape, size, and color have nothing to do with quality, the ugly produce gets thrown out.

Almost all of the reasons of retail waste is connected to the financial worries. In retail and also household steps, by making small and efficient changes, it is possible to make a significant impact on the amount of waste also on the previous stages. The company policies are made to answer financial worries, not the environmental issues. Marketing strategies, including placement and design, campaigns for buy one get one or others all contribute the food waste eventually, either in-store or later at home.

MARKETING STRATEGIES

According to Martin Lindstrom, the produce department is staged like a movie set to help the client link the vegetable and fruit zone with garden or kitchen; the spaces s/he is familiar to.[1] Architectural and sensory arrangements like being a closed box, lighting choices, the order of the products, implied in general to the supermarkets are developed throughout time to sell more and increase the profits.

Unfortunately, the more environmentally friendly marketing strategies like discounting 'the food closer to the expiration date' is relatively new to the marketing studies and they are not the priorities. **Wasting food is not done intentionally, but in order to develop further strategies, it is essential to understand the mistakes of markets causing food waste.**

PROBLEM 1: PLACEMENT

The retailer's handbook published by 'American Supermarket Association,' suggests to arrange the produces according to color in order to create harmony to attract the eye of the customer.

PROBLEM 2 : WATERING THE PRODUCE

Although used to give fresh foods a deceptive dewy and fresh-picked look, the watering produce has no practical purpose. According to the food microbiologist Randy W. Worobo, spraying limits shelf life, because the extra water lets microorganisms start degrading and eventually spoiling plant tissue. Water can also spread microbe contamination from intact roots or other plant parts. [2]

PROBLEM 3: STACKING THE PRODUCE

In the interviews with vendors in farmer's market[3], they stress is that if there is a few produce left on the stand, people would think it is bad and **never** buy it. Instead, if the consumer sees the shelf full of vegetables, would feel more comfortable about purchasing. Markets or any fruit vendor following this reality, choose to stack the produce at the cost of losing the ones left below to earn the customers trust.

1 Lindstrom M. (2011) Brandwashed: Tricks Companies Use to Manipulate Our Minds and Persuade Us to Buy. [Kindle Version]. Retrieved from http://www.amazon.it/

2 Ray, C., & Worobo, R. (2011, November 15). Keeping Greens Green. The New York Times, p. D2. Retrieved from http://www.nytimes.com/2011/11/15/science/does-spraying-greens-with-water-keep-them-fresh.html

3 Rustemeyer, J. (Producer), & Baldwin, G. (Director).2016. Just eat it : a food waste story [Documentry]. , Pennsylvania: Bull dog Films

WHAT SHOULD BE DONE?

Before doing a placement or other actions, the chemical interactions and physical limits of fruits and vegetables should be taken into consideration.
- Ethylene is a hormonal gas released mostly from fruits during respiration. **To correctly place the produces, it is recommended to divide them into two groups: ethylene releasers and ethylene sensitives.** So these groups should not be put together in the greengrocer section arrangement since the interaction shortens their lifespan.
- Instead of stacking them, **they should be placed in an order to leave enough space for respiraiton.**
- It is true that plants need humidity, but spraying water on top of them accelerate the rotting process., so instead **the optimal humidity levels should be reached on the air or by correct storage.**

SELF- JUSTIFICATION: GUILT- FREE SHOPPING

Abundance and the power to buy are also other consumer attitudes seen in high-income countries, leading to waste food. [1]

The amount of available food per person in retail stores and restaurants has increased during the last decades in both the US and the EU. A lot of restaurants serve buffets at fixed prices, which encourages people to fill their plates with more food than they can eat. Retail stores offer large packages, oversized ready to eat meals and "buy one get one" bargains. **While using all the weapons to appeal 'the greedy consumer,' for the 'rather conscious consumer' other approaches are being implemented.**

According to the psychoanalytic philosopher Slavoj Žižek, the big companies are using the morality card in order to make the customer feel good and guilt free[2]. They put advertisements about campaigns showing that the company is donating the leftover food or ensuring that another pair of the product they buy will be given as a gift to a person in a third world country. The companies reassuring the consumer that also these aspects are taken care of and made them feel environmentally conscious and proud. This attitude fortifies the bond between consumer and the retail and triggers the customer to over-buy which eventually ends up being wasted again in the next step and by misleading the market indirectly causing more imbalance in the food distribution.

1 Evans, D., Campbell, H., Murcott, A. (2013). Waste Matters: New Perspectives on Food and Society. Victoria : John Wiley & Sons

2 Zizekian Studies. (Nov 19, 2015). Slavoj Zizek | Consumerism and Waste | Short Film.https://www.youtube.com/watch?v=vGpc_hg48ps&t=10s

PACKAGING WASTE

In addition to the waste caused by watering, overstocking, wrong placement, another waste-generating issue is packaging. Even without food, single use plastic bags are very problematic for the environment.

According to a Swedish household diary, **20-25% of food was wasted due to packaging factors with reasons like packages being too large, packages being difficult to empty and best before dates having passed**[1]. Moreover, plastic packaging waste by supermarkets, are as much damaging to the environment as the food waste itself. **Fruits and vegetables already come in their natural wrapping. Why do we smother them in plastic?**

According to the data of Defra, the Department of Environment and Rural Affairs of UK, the island produces 3.6 million tonnes of plastic waste every year in which 1.5 million tonnes comes from the form of packaging.[2] The 13% of the total waste created in the world is made of plastic, not necessarily from food packaging. Additional data is that when the packaging gets damaged, supermarkets choose to throw away also the food inside even if it is perfectly fine.

Although pre-prepared fruits and vegetables are providing great help for reusing the tasty but ugly produce that got rejected by the markets, peeling off the product from its skin which is the best protection, cutting and placing in a plastic box, both leave the produce vulnerable, shortens its lifespan and creates additional plastic waste. So the produce which is saved in the earlier step, becomes a waste in the latest stages, augmenting the economical and environmental side effects of waste.

A supermarket in Ankara, Turkey and the fruit section is full of produce inside the plastic. They are untouchable as retailer explains proudly; 'If a customer touches the vegetables, the other customer doesn't want the touched produce, so we wrap them in plastic and every pack becomes individual. But if the customers wish in smaller sizes it is possible to divide the packaging.' (MacroMarket greengrocery responsible) The methodology they use is to suck the air from the packaging so without air the produce goes longer since there is no interaction with oxygen and also it is a way to deal with the customers anxieties. Likewise, in Milan there are the plastic gloves for the customers in order to keep the hygiene of the produces.

1 Hoornweg, D. and Bhada-Tata, P. (2012) What A Waste : A Global Review of Solid Waste Management. Urban Development & Local Government Unit, World Bank. - Urban Development Series Knowledge Papers 15.

2 Directive 2004/12/EC of the European Parliament and of the Council of 11 February 2004 amending Directive 94/62/EC on packaging and packaging waste - Statement by the Council, the Commission and the European Parliament

SUMMARY

After seing the possible reasons of food waste in retail it is clear and easy to understand that all the problematic acts in the retail stage, are made to appeal the client and make him/her buy more. The major part of the food waste, in every step of the life-span, except the technical constraint is caused by the final stage; the misleaded perception, and ignorance of the consumers towards vegetables and fruits. So the first step should be educating the consumers. If the consumers would be more knowledgeable and conscious about their shopping decisions, a lot of unnecessary waste can be prevented easily by doing so.

At the same time, while the effect of consumer on retail decisions are inevitable, it is also true that also the supermarket have a great power of manupulation or giving direction to the consumers mind. All two sides considered, not only the customers but also vendors and retail workers should make an effort to inform and lead people, in a system of collaboration between retail and household. Food is something being bought in any case, either more or less. Not wasting food is also beneficial for the economy of the markets, in the end, everything that has been thrown away has to be paid.

Fortunately, the supermarkets are starting pay more attention on this subject everyday and not all of them have the same priorities and interests; in the following pages, there are the choosen examples from the innovative entrepreneurs which are working on solving the food waste issue.

1 Dixon-Hardy, D.W., Curran B. A. (2008). Types of packaging waste from secondary sources (supermarkets). Waste Management 29 (2009) 1198-1207.

2 Wolchover, N. (2011, March 02). Why Doesn't Plastic Biodegrade? Retrieved July 29, 2017, from https://www.livescience.com/33085-petroleum-derived-plastic-non-biodegradable.html

3 Photo : Krista van der niet. 2008. Fruit. Amsterdam.

CASE STUDIES

1. **Ben Biron** / Wasteless
2. **INFARM** / Metro Cash and Carry
3. **Nicole Klaskin** /The Good Food
4. **Zona SUL**
5. **Intermarche** / Inglorious Fruits and Vegetables

Ben Biron // Wasteless

UNITED STATES - 2016

TARGET: DECREASING WASTE IN STORE

Wasteless allows supermarkets to sell more and waste less. The solution leverages dynamic pricing that lets consumers choose how much they want to pay for a product based on its expiration date. Wasteless continuously monitors stock levels, if an item is almost out of stock, the store is alerted. If it has been on the shelf for too long, the price can be automatically reduced. This means supermarkets never run out of their customer's favorite products.
Wasteless recaptures lost revenue opportunities like food waste cost and outofstock costs, and creates new revenue opportunities by increasing the availability of products.

Basically the produces which are closer to the expiration date automatically gets a reduction, so the customers are encouraged to buy the cheaper one. The system is in trial with several retailers and the deman is high. Their aim is to save 1 billion dollars of lost grociers every week.
This is a very clever invention, also to increase the credibility and honesty of the markets, the older produces don't need to get hidden, they are on discount.

One negative aspect of this system is, that the customer who buys the old product has to consume it in a short time: if not, than the produce will turn into waste at the next stage.

Metro Cash &Carry // INFARM

GERMANY - 2016

TARGET: DECREASING FOOD MILAGE AND HAVING FRESHER VEGETABLE& FRUITS

Infarm is a start-up company, specialized in urban farming especially by vertical garden technologies.
Introducing "farming as a service," INFARM has launched "the first in-store farm in Europe" at a Berlin METRO supermarket, with the mini herb garden. It looks like a tiny greenhouse inside the store, and shoppers can pick their own freshly harvested salad greens and herbs right from the growing plants.

The modular INFARM units don't have to just grow greens and herbs, however, and can be configured for different crops, such as tomatoes or peppers, and thanks to its vertical or stacked nature, which allows for more plants per square foot, it can fit into a relatively small footprint.
Considering the long journey that most fresh produce travels to the store, and the high level of spoilage/shrinkage/waste in retail produce departments, growing at least some of the food right on the sales floor might be a better all around option for both the store and the customers. These vertical micro-farms as a natural fit for some restaurants, hotels, or retreat centers, where they can produce a little of their own local food even in a small space.

MATERIALS: VERTICAL GARDEN TECHNOLOGY, ARTIFICIAL SUNLIGHT, SEEDS GROWING ON A TRAY WITH HYDROPHONICS

Top // The office of INFARM, with a vertical garden
Middle // The farm's view from the outside, situated at the greengrocery area of the Metro Market in Berlin.
Bottom // Detailed views from the vertical garden technology, the seeds are grown without soil on a type of cotton with circulated water.

Nicole Klaskin //The Good Food

GERMANY - 2017

TARGET: DECREASING WASTE IN FIELDS

The Good Food is a supermarket in Germany, Köln that sells only wasted or unwanted food. The vegetables and fruits which are too ugly to be selled in the mainstream supermarkets, they collect the left over product from the fields or the farmers give to them and they sell it for reduced prices.

Buyers can also find non-perishable products from big manufacturers which have passed their sell-by dates. The market sells them giving the information that the product is expired, but they are also willing to take the risk of being sued.

They also cook and sell ready made meals prepared from the wasted food only.

Other groups like this called RECUP works in the farmer's markets of Milano in order to save the food from getting trashed. Also Stuart Tristram, who is quoted many times throught out this thesis is a supporter of market saving actions, dumbster diving and gleaning which are other anti food waste movements that are spreading all around the world in order to save the food still good to be eaten.

'The good food' is the institutionalize face of these generally individual activities which are usually despiced and associated with poverty. It is a big step for educating people and widening their perspective.

Zona SUL

BRASIL- 2016

TARGET: TO KEEP THE VEGETABLES FRESH FOR EXTENDING THEIR LIVES

Brazilian supermarket Zona Sul has an actual mini "fresh vegetable garden" in a Rio store so that customers can pick their vegetables right out of the ground.

The fresh Garden initiative, by WMcCann in Rio, offers customers a selection of vegetables and herbs, including lettuce, basil, peppers and spring onions, grown in beds. Signs on the shelves said "When serving it at home you may proudly say "I picked it," or "We plant and take care of it. You only need to pick it."

The agency claims the campaign has resulted in an 18% increase in vegetable sales and a 30% uplift in customer preference for Zona Sul's vegetable section. Unlike INFARM, they are not planting and growing the plants from scratch inside the store, they plant outside and then move the plant to the soil trays inside the market. This way the vegetable always stays fresh.

The positive outcomes are lengthening the life of the fruits and vegetables, cutting the transportation and processing costs and also environmental impacts.

Intermarche// Inglorious Fruits and Vegetables

FRANCE- 2014

TARGET: TO PREVENT WASTING UGLY FRUIT

Some responsible retailers, came up with some ideas to solve the situation of food waste in agriculture caused by aesthetics. The French supermarket 'Intermarche' started to buy imperfect produce, that is usually thrown out, at a 30 percent discount from growers. They gave the fruits and vegetables their own aisle and prominent displays, included their names on receipts, and distributed soups and fruit juices made from the inglorious produce, to quell any fears that the seemingly Frankenstein fruits and vegetables were any less delicious than their comely counterparts.

They marketed the ugly produce, and it worked, in one month over 13 million people have shopped from the ugly produce section. It also inspired another project in Oakland, California, a start-up called 'Imperfect'. With the help of an online platform, they are taking the imperfect fruits and vegetables from the farms and selling them to the inhabitants of Berkley and Oakland, in a way both cutting the carbon emissions of long travels by staying local and saving greens.

3.4 Household

The last stage of food waste (and the highest percentage) happens in the consumer-end. In this project, it has been decided not to cover the food services like restaurants and cafes where the food is eaten outside the house, since it needs an entirely different approach, and the percentage of waste is not as high as the household food waste. **So the primary importance has been chosen to be given to the very end of the vegetable and fruits life cycle span, which is the consumer's house.**

The final step, human at their own **houses are responsible for 53% of all the waste made**, so more than half. Since it is the most final, most prepared state of foods, the annual cost is **in total 98 billion euros.**[1] The influence of consumer habits and choices on, food waste in the earlier stages are not included in this percentual value and cost.

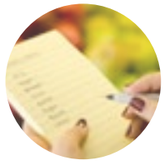
The abundance of cheap food in developed countries has made the consumer negligent about wasting it. In 1980s, British households would have to spend 16% of their income on food, now it has decreased to 9%. In Pakistan, on the other hand, a family has to reserve 75% of their earnings for buying food. [2]

The people who can afford to buy excess food, even if they know they won't eat it, gives a subliminal sense of affluence, as a buffer zone between s/he and the hunger. **The consumers of the western world have become disconnected from the reality of food, where it is coming from, how it gets produced,etc. Wasting is a simple action that we can afford and take for granted; no one is informed or choose to regard the environmental impacts; moreover, we are not aware that wasting food causes hunger elsewhere in the world.** To solve this major problem the first step is to define the reasons and triggering factor. Following there are the reasons of waste in household found from the literature search and supported by the survey made by the author which will be mentioned on the next page.

1 Stenmarck, A., Jensen, C., Quested, T.,Moates G. (2016). Estimates of European food waste levels. Fusions: Reducing Food Waste Through Social Innovation.

2 Ivanic, Maros; Martin, Will. 2008. Implications of higher global food prices for poverty in low-income countries. Policy Research working paper ; no. WPS 4594. Washington, DC: World Bank.

Before Shopping



POOR PLANNING

CONTROLLING ALREADY POSSESED GOODS// Forgetting to check the stocks of food in cupboards and fridge before shopping to see what is missing.

INSUFFICIENT PLANNING //Without meal plans and shopping lists, consumers often make inaccurate estimates of what and how many ingredients they will use during the week.

During Shopping

OVER BUYING

PROMOTIONS AND DISCOUNTS// Sales on unusual products and promotions encouraging impulse and
bulk food purchases at retail stores often lead consumers to purchase items that don't fit into their regular meal plans and spoil before they can be used.

UNAVAILABILITY OF SMALLER QUANTITIES // Pre-packaged products, eliminating the option of preferance force the customers to buy more than neccesary.

After Shopping

STORAGE

FOOD SPOILAGE // About two-thirds of food waste at home is due to food not being used before it goes bad.[1] Because of;

Improper Storage

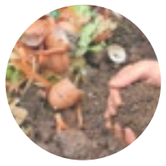
Lack of invisibility

Partially used ingredients

Missjudged food needs

COOKING

OVER-PREPAIRING AND LEFT OVERS // The remaining third of household food waste is the result of people cooking or serving too much food. Cooking portions have increased over time and large meals often include more food than we can finish which we tend to put in the garbage while the food is still edible.



DISCARDING

DATE LABEL CONFUSION // Discarding of food due to confusion over the meaning of date labels (e.g., "sell by," "best if used by," "expires," etc.). Also the tendecy of discarding immediately after the date of expiration(even it is possibly still edible).

LACK OF KNOWLEDGE REGARDING HOW TO DEAL WITH LEFTOVERS // Discarding everything, regardless of edible or plantable parts (broccoli stems, tops of pineapples, etc.), or not considering composting.

1 Natural Resources Defense Council (2014, November).Saving Leftovers Saves Money and Resources.Retrieved on April 2015 from http://www.nrdc.org/living/eatingwell/saving-leftovers-saves-money-resources.asp.

The left fridge belongs to ; bartender who goes to bed at 8am and wakes up at 4pm is filled with take-out containers with conspicuously empty crisper drawers. The right fridge belongs to a midwife and middle school science teacher who are eating local produce.[1]

To see the realities around the author's close circle, conducted a general survey in 100 people in between ages, 18-60, living in developed countries having above-average incomes living with their friends or family or alone. The amount they spend is in between the bracket 10-250 euros on a weekly shopping, and majority of them (52%) go to shopping 2-3 times a week.

As mentioned in the previous page, wrong storage leads to spoilage which is the two-thirds of the whole household waste. The improper storage is the common problem, not only leaving the produce in the fridge and forgetting them, but consumers also do not know where to store the produce and in which conditions. **88% of the participant's store tomatoes inside fridge, which is the most common mistake, followed by 82% of green-leaves and herbs. In another question about which food they waste the most, the first three answers given on the list are green leaves, herbs, and tomatoes.**

The outcome of the survey although carried out in a limited number of participants, give us minor clues about the fridge is misused, and for some fruits and vegetables, the cold temperatures of the refrigerator are not so suitable as we take for granted.

1 Greig, A. (2013, November 18). What does your food say about you? Peek inside the fridges of people from all walks of life, from the bartender with only take-out containers to the overgrown shelves of a lonely botanist. Retrieved September 2017, from http://www.dailymail.co.uk/news/article-2509116/What-does-fridge-say-Peek-inside-fridges-walks-life.html

FRIDGE

For the modern consumer, food storage means 'Fridge'. But before the invention of the fridge in 1913, preserving the food fresh used to be fairly harder, so especially vegetables and fruits were bought and consumed daily. There were some developed ideas like ice houses or wells which were used to provide cool storage for most of the year. Placed near freshwater lakes or packed with snow and ice during the winter, used to keep the food cool through the summer. These techniques worked better in the rural areas since proximity to nature, preferably to a lake, was the main advantage. But even in the cities, every house had its basement to use as a cellar, for keeping the produce fresh. Even though now we have fridges to reach the level of coldness easily, the food tends to rot faster than before.

The access to surplus food for lower prices in developed countries, the supermarket manipulations with sales, buy one get one campaigns, combined with **the physiological security of having a fridge to store everything safe causes the extra food to be left in an invisible corner, forgotten and wasted.**

A study of modern human physiology on food waste claims that 'Storing surplus food is often associated with a process of saying goodbye. The moral understanding of not wasting food makes consumers not to throw food out immediately, but rather store the food before it is considered as waste.'[1]

The supermarkets as a policy should stop marketing excess food, but it is also questionable if in the consumer's decision-making and conscious knowledge about storing are involved, the explicit knowledge might be less relevant than traditional knowledge, not necessarily reflecting how food is stored and not being aware of food that is still edible. So the consumer doesn't have enough knowledge or tools to make the correct decision about the optimum conditions of food storage, especially in vegetables and fruits because unlike others they don't have a certain date or info claiming the end of life on their packaging.

On their research about household food waste, Winkel and Wahlen links traditional knowledge and general acceptances with food storage as: 'Routines, tacit knowledge, and bodily performance are totally connected to appropriate storing units such as drawer cabinets increasing the visibility of food, or the household storage system in visible containers, making it easy to recognize food still edible.'[2] Also in the author's survey supporting Winkel and Wankel, 45% of the participants state that they learn how to store from the elder members of the family, whereas 29% of them learn with experimentation.

Like Mcdonough expresses **'One size doesn't fit for all.' The general approach of placing everything in the refrigerator should be reconsidered with new technologies and increasing ecological intelligence.** There are many studies and experiments done about the best-storing conditions also showing the life expectancy. Although to distinguish which is more efficient, **the user experience is essential especially depending on the climate and conditions of the region where are the produces.**

Realizing the importance of storage to avoid food waste, has led to a detailed research **about the optimal storage conditions of fruits and vegetables based on written and verbal sources.** Most of them experimented and proven to lengthen the lifespan of the produces (in the climate of Milano) while making them more visible, are categorized and documented in the next pages.

1 Evans, D., Campbell, H., Murcott, A. (2013). Waste Matters: New Perspectives on Food and Society. Victoria : John Wiley & Sons.

2 Winkel, T. D., & Wahlen, S. (2017). Household Food Waste Science Direct. Accessed Apr 24.

The Optimal Storage Areas of Fruits and Vegetables

Ethylene Sensitive Vegetables and Fruits

The optimal storage conditions of the fruits and vegetables that will go bad faster in case of too much contact with ethylene producers

BROCCOLI

TEMPERATURE // 0 °C
TIME // 20 days
WHERE// In the fridge

HOW// Put inside a cup, which is filled with water in the bottom only to touch the stem in order to avoid dehydration.

PEPPER

TEMPERATURE // 7-13 °C
TIME // 5-7 days
WHERE// Outside fridge

HOW// Put inside a breathable bag and store it in a cool place, fridge is too cold and humid for peppers.

CUCUMBER

TEMPERATURE // 10-12 °C
TIME // 2 weeks
WHERE// Outside fridge

HOW// Cucumber needs a lot of humidity so the best is to store it humid and dark on the counter. Before usage it can be soaked into the cold water for refreshment.

EGGPLANT

TEMPERATURE // 10-12 °C
TIME // 14 days
WHERE// Outside the fridge

HOW// Inside fridge, eggplant loses its flavour, should stay outside fridge and in high humidity conditions.

ASPARAGUS

TEMPERATURE // 0-2 °C
TIME // 10 days
WHERE// In the fridge

HOW// Put inside a cup, which is filled with water in the bottom only to touch the stem in order to avoid dehydration and seal the remaning top parts with a paper bag.

STRAWBERRY

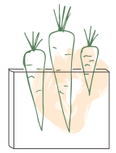
TEMPERATURE // 0 °C
TIME // 5 days
WHERE// In the fridge

HOW// Don't wash before the usage time and leave the tops, put inside layers of fabric for excess humidity, in a breathable container.

ORANGES

TEMPERATURE // 4-7 °C
TIME // 1 month
WHERE// Outside fridge

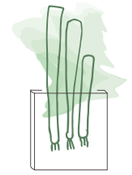
HOW// Inside beewax paper or fabric, on a cool area.



CARROTS

TEMPERATURE // 0-20 °C
TIME // 2-3 months
WHERE// Outside the fridge

HOW// The carrots grow vertically, storing them vertically in a sand makes the carrot to spend less energy, and sand provides the humidity needed.



GREEN ONIONS

TEMPERATURE // 0-20 °C
TIME // 4 weeks
WHERE// Outside the fridge

HOW// Put inside a cup, which is filled with water on the bottom for the stems,change the water when its needed, the onions will keep growing and always stay fresh.

GREEN LEAVES

TEMPERATURE // 5-20°C
TIME // 10 days
WHERE// In the fridge or outside

HOW// If inside fridge, wrap in a breathable paper to take the humidity, outside put inside a cup, filled with water on the bottom, never cut always peel while eating.

PINEAPPLE

TEMPERATURE // 7-10 °C
TIME // 5-7 days
WHERE// Outside fridge

HOW// Since pineapple is a tropical fruit, it should stay outside fridge in a cool area, unless cutted.

GARLIC

TEMPERATURE // 20-30 °C
TIME // 1-2 months
WHERE// Outside fridge

HOW// The best way to store is to hang in a netted bag like the ones in supermarket, can be also put in a small wicker basket, it should be dry and away from sunlight.

GREEN BEANS

TEMPERATURE // 4-7 °C
TIME // 2 weeks
WHERE// Outside the fridge

HOW// Wrapped in a breathable tissue and stored in a cool, dark place.

POTATOES

TEMPERATURE // 10-20 °C
TIME // 3 weeks
WHERE// Outside the fridge

HOW// Should stay dry and dark, because sun light turns the skin to green, should be put in a breathable container close to apples which slows down the ripening.

WATERMELON

TEMPERATURE // 13-21 °C
TIME // 15 days
WHERE// Outside the fridge

HOW// Should stay in a cold dark place, after cutted, should stay in the fridge in a closed bag maximum 2-3 days.

COURGETTE

TEMPERATURE // 8-10 °C
TIME // 14 days
WHERE// Outside the fridge

HOW// Courgette needs a cool and humid place, keeping in fridge results in chilling injuries.

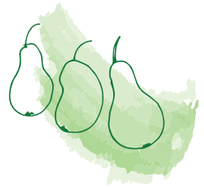
Ethylene Producer Vegetables and Fruits

The optimal storage conditions of the fruits and vegetables that will go bad faster in case of too much contact with ethylene producers

BANANA

TEMPERATURE // 15-20 °C
TIME // 10 days
WHERE// Outside fridge

HOW// Since they produce a lot of ethylen also to ripe themselves easily, they should be hanged so there is air circulation all around.



PEARS

TEMPERATURE // 0-10 °C
TIME // 2 months
WHERE// Inside and outside fridge

HOW// Wrap in a breathable paper bag after it is ripe put inside the fridge.

The most important consideration in the storage issues, are separating ethylene producers and ethylen sensitives as much as possible since they effect each other in a significant difference. Another important point is the level of humidity needed for the prdouces. The climate and season also plays a very distinctive role such as a fruit in a cold humid climate can easily stay outside the fridge even on the counter without going bad, whereas the same produce can rotten in a warm arid climate easily in short time. The vegetables can be grouped like this;

ETHYLENE PRODUCERS
INSIDE FRIDGE

90-95% HUMIDITY

grapes
apricots
cherries
berries
apples

ETHYLENE PRODUCERS
OUTSIDE FRIDGE

85-90% HUMIDITY	90-95% HUMIDITY	65-70% HUMIDITY
pineapple	apple	onion
banana	pear	
lemon		
avocado		
tomato		

APPLES

TEMPERATURE // 1-15 °C
TIME // 6 weeks
WHERE// Outside fridge

HOW// Some types should be stored in fridge some outside but in every cases they should be seperated from each other, good relationship with potatoes.

AVOCADO

TEMPERATURE // 5-13/2-4°C
TIME // 2-3 days /1 month
WHERE// Outside & Inside fridge

HOW// Outside before ripen in a paper bag, after ripe inside the fridge with a net sack.

BERRIES

TEMPERATURE // 0-5 °C
TIME // 1 week
WHERE// Inside fridge

HOW// Should stay in a perforated container and washed before use. If seen any with some mold should be taken away immidiately, to stop spoiling the whole.

TOMATOES

TEMPERATURE // 10-13 °C
TIME // 3-14 days
WHERE// Outside fridge

HOW// Tomatoes loose their taste in fridge temperatures, they sould be either hanged for air circulation or on a plate with tops looking on the ground to keep the moisture inside.

ETHYLENE SENSITIVES
INSIDE FRIDGE

95-100% HUMIDITY

broccoli
asparagus
leafy greens
strawberry

ETHLENE SENSITIVES
OUTSIDE FRIDGE

85-90% HUMIDITY	95-100% HUMIDITY	65-70% HUMIDITY
peppers	carrots	garlic
eggplant	green	
courgette	leaves	
cucumber	green	
potatoes	beans	
watermelon	green	
oranges	onions	

GRAPES

TEMPERATURE // -1-0 °C
TIME // 5-7 days
WHERE// Inside fridge

HOW// SShould be hanged in a slightly closed container since the grapes can absorb every the smell inside the fridge.

LEMONS

TEMPERATURE // 12-14 °C
TIME // 6 months
WHERE// Outside fridge

HOW// Lemons need high humidity and air circulation around. Should be kept in a cool area.

APRICOTS

TEMPERATURE // 0 °C
TIME // 5-7 days
WHERE// Inside fridge

HOW// Wrapped in a breathable paper.

CHERRIES

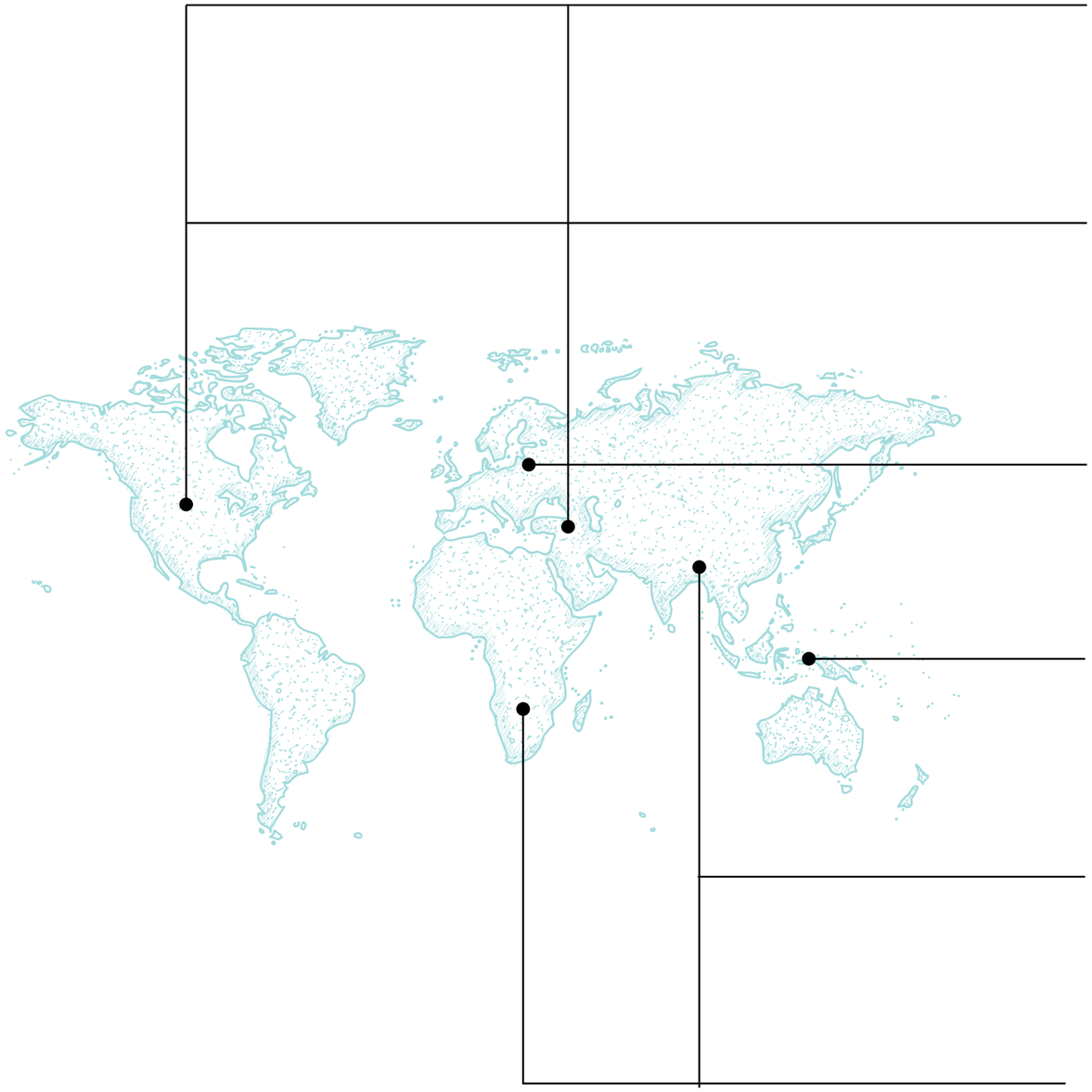
TEMPERATURE // -1-0 °C
TIME // 5-7 days
WHERE// Inside fridge

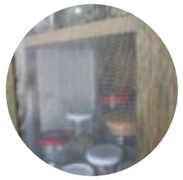
HOW// They should be put in a perforated but closed container in the coldest area of the fridge,like grapes they are absorbant to all the smells around. Wash before use.

Looking at the charts and the fact sheets of produces shows that a lot of storage knowledge that has been taken for granted is wrong. The refrigeratort offers a standard temperature range from 0-4 °C. but the optimal storage degree of the majority of the products are in between 6-12 °C and for this range it doesn't exist a dissolved modern storage idea.

The elder generations knew how to store the produces in the absense of refrigerator, the technology, alongside with a lot of usefull opportunities, unfortunately triggered lazyness and ignorance. So the next part consists of the old traditional ways of storage and other less known innovations designed recently.

Traditional Storage Ways





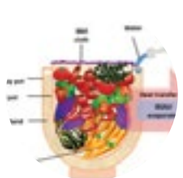
Meat Safe - Tel dolap
North America, Turkey
A cupboard with a transparent opening made from wire net, used to keep insects away from the food additional to storage. Should be placed in the shady and cool part of the kitchen.

Root Cellar
North America, Turkey
A root cellar is a structure, usually underground or partially underground, used for storage of vegetables, fruits, nuts, or other foods.

Storage clamping
Europe
Used after the harvest to preserve the root crops, the crops are sandwiched in between straw and covered with soil, can be also burried under the ground.

Burrying Food
Australia
Burying the food in a cealed metal bin, to keep it fresh and cold

Banana Leaves
Asia
Wrapping the vegetables to banana leaves and sprinkling water all around is a way of organic preservation, also can be cooked.



Pot in pot refrigirator - Zeer
Africa, Asia
It uses a porous outer earthenware pot, lined with wet sand, contains an inner pot within which the food is placed.The evaporation of the outer liquid draws heat from the inner pot.

CASE STUDIES

The cases are mostly based on storage techniques, which is seen as the major problem. It is included also an analyze of materials based on the storage ideas and material usage chosen by the designers of the cases.

1.**Fabio Molinas** // OLTU
2. **Jihyun Ryou** // Save Food From the Fridge
3.**Floris Schoonderbeek** // Ground-fridge
4. **Kengo Kuma & Associates** + **College of Environmental Design UC Berkley** // The Nest We Grow

Fabio Molinas // OLTU

SPAIN, 2013

TARGET: TO CONVERT THE FRIDGE HEAT RELEASE TO A NATURAL COOLER WITH EVAPORATION

OLTU takes advantage of the heat produced from the back of a fridge, which in today's fridges is wasted energy, and uses it to help to cool the "totem" of vegetables via cooling by evaporation.

The structure works like a 'Zeer- pot in pot refrigirator'. The heat rises and affects the double wall of the clay containers, which, with the help of the water contained between their walls, is able to lower the temperature thanks to the heat extracted from their interior, recreating the ideal atmosphere for the needs of each group of vegetables.

It is a sustainable product because, as part of its functioning does not depend on energy, costs are minimal and, most importantly, each item is kept fresher. It is an industrial product with an aim of also educating the users about storage and vegetables. Each person can now have a general knowledge about the needs of vegetables and preserve them in a more responsible and natural way intead of placing everything in fridge.

MATERIALS: CERAMICS, MAPLE WOOD

Jihyun Ryou // Save Food From the Fridge

NETHERLANDS, ITALY, KOREA - 2009

TARGET: TO DESIGN ADDITIONAL STORAGE SYTEMS FOR PRESERVING FOOD OUT OF FRIDGE

The project is about traditional oral knowledge which has been accumulated from experience and transmitted by mouth to mouth. Particularly focusing on the food preservation, it looks at a feasible way of bringing that knowledge into everyday life. The aim of the project explained with the words of the designer Jihyun Ryou;
"Observing the food and therefore changing the notion of food preservation, we could find the answer to current situations such as the overuse of energy and food wastage.

My design is a tool to implement that knowledge in a tangible way and slowly it changes the bigger picture of society.

I believe that once people are given a tool that triggers their minds and requires a mental effort to use it, new traditions and new rituals can be introduced into our culture. She is against handing over all the responsability of taking care of food to the refrigerator, so based on her researches and interviews with elderly people about traditional ways of food storage, she designs these modular pieces to re-introduce and re-evaluate the traditional oral knowledge of food, which is closer to nature.
She also has a blog which is like a database for everyone to share their knowledge about their traditions of food storing outside of fridge.

MATERIALS: STONE, SAND, MAPLEWOOD TREATED WITH BEEWAX, GLASS

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1. Vegetables on top of a little water creating humidity can be stored longer and preserve its taste better.
2. Root vegetables, stored vertically to not to loose energy inside sand to keep the dryness.
3. Green leafy vegetables such as lettuce, cabbage and similar greens are alive and can be stored outside the fridge by adding some water underneath them. However only the stem or root should touch the water.
4. Eggs are very sensitive to any kind of smell. This creates a bad taste if it's kept in the fridge with other food ingredients.
5. Apples and potates kept together beacuse they create a symbiotic relationship. Potatoes on the bottom since they need to be in the dark.

Floris Schoonderbeek // Groundfridge

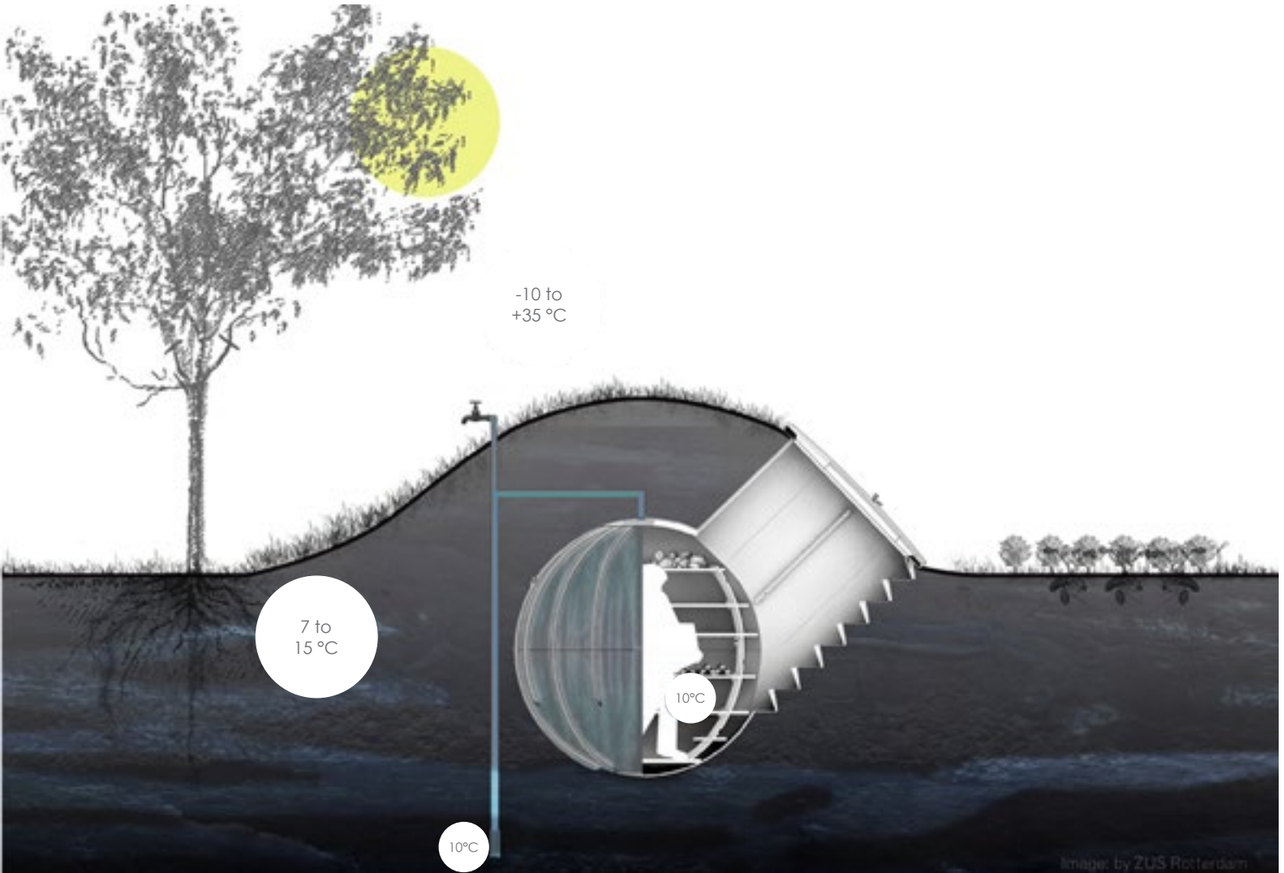
NETHERLANDS - 2016

TARGET: TO RECREATE A ROOT CELLAR ENVIRONMENT

The Groundfridge is an innovative take on the traditional root cellar. The designers main mission is to promote sustainable living systems.
The Groundfridge has a capacity of 3000 liters, which is equivalent to 20 refrigerators, holding half a ton of food.
The hand-laminated polyester unit with tight sealing door creates a good insulation from the air and easy to install, of course if there is available spots around.

No need to take away any dirt; dig a hole, drop it in and put the dirt back on top. Keeping it partly out of the ground also helps deal with high water tables, they have in the Netherlands.
Since it is burried under ground, the temperature inside is 10 degrees, creating a natural optimum environment for preserving vegetables and fruits.

MATERIALS: LAMINATED POLYESTER, WOOD FOR THE SHELVES



Kengo Kuma & Associates + **College of Environmental Design UC Berkley** // The Nest We Grow

JAPAN - 20014

TARGET: TO CREATE A LOCAL FOOD COMMUNITY CENTER

The Nest We Grow is an open, public structure with the main aim of bringing people in the community together to store, prepare and enjoy local foods in the setting of Hokkaido, Japan.

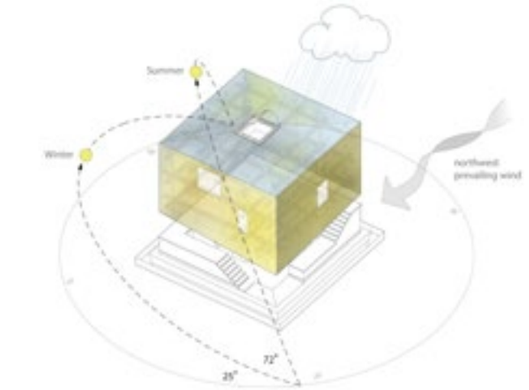
The wood frame structure which is coming from American heavy timber construction, mimics the vertical spatial experience of a Japanese larch forest from which food is hung to grow and dry.

The building is very coherent to the climate of the region and the components lile the base walls or transparent plastic corrugated sheets provides versatility for seasonal changes. Like the wall at the base blocks the northwest winter wind whereas the sliding panels facilitate air movement during the summer and warmer parts of the day. The seasonal food is produced on the facade or around the nest and hanged in order to be preserved longer.

The program of the Nest is decided according to the life cycle of these local foods: growing, harvesting, storing, cooking/dining, and composting, which restarts the cycle. All members of the community help to complete each stage, allowing the structure to become a platform for group learning and gathering activities in the Nest throughout the year.

This project is an inspiration not only with the functionality of it but also the way of taking advantage of nature in order to achieve the maximum positive results.

MATERIALS: TIMBER, CORRUGATED TRANSPARENT PLASTIC SHEET



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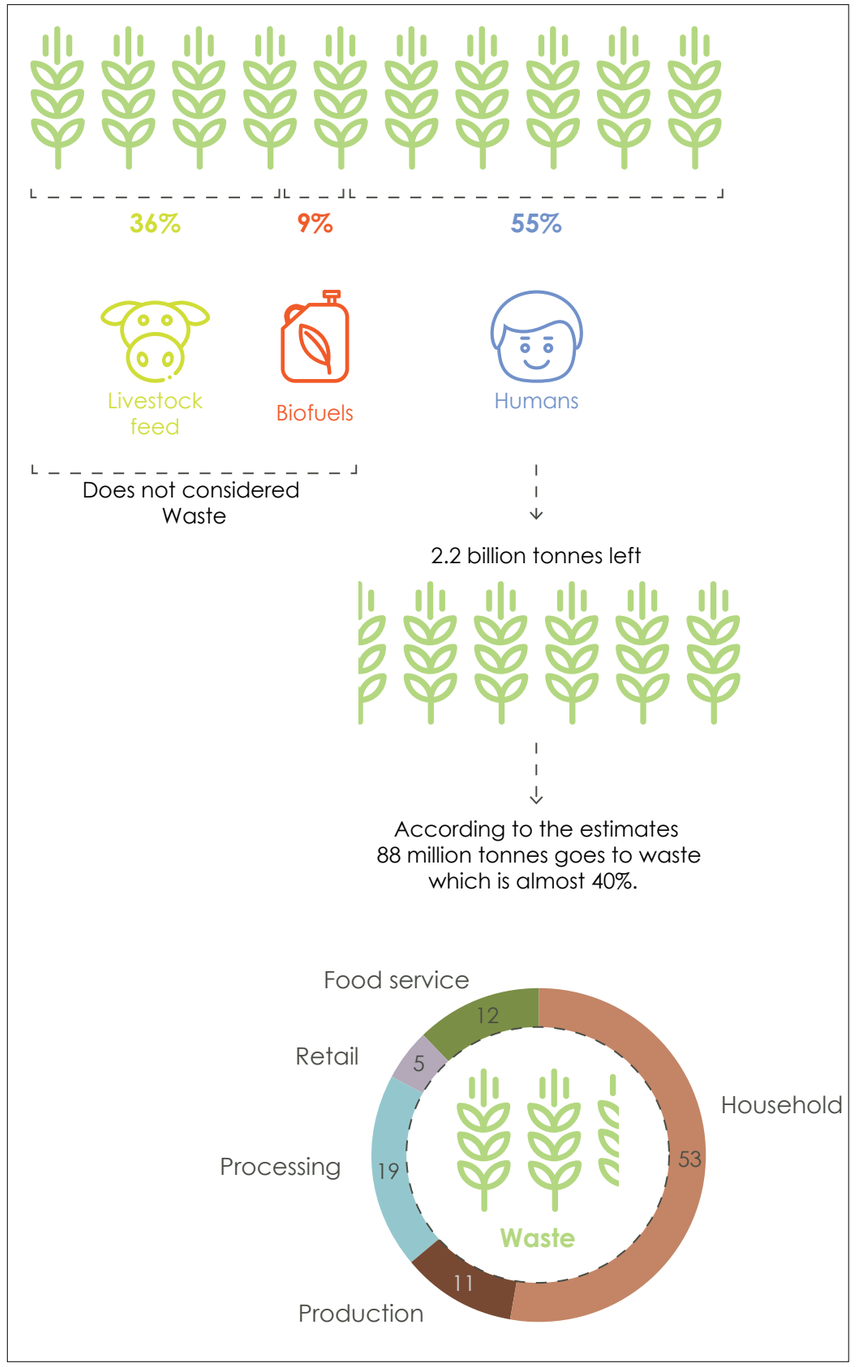
SOLUTIONS



Overview //

IT IS IMPORTANT TO REMEMBER WHEN THE PRODUCT IS BOUGHT AND HOW MANY DAYS CAN IT LAST.

The dating system which is applied for almost every product from dairy to canned, is not used for the vegetables, the consumer brings these materials to home without knowing anything about their expiration dates and then decides depending on their outward appearances. This can be fixed by giving more detail about expiration dates and also providing the correct storage information on the packaging or in the etiquette

EVERY FRUIT OR VEGETABLE NEEDS A SPECIFIC SOLUTION FOR STORAGE IN ORDER TO EXPAND THEIR SHELF LIFE.

Although fridge is a great help for keeping a lot of food, the habit of putting everything in the fridge is not correct for all the edibles. The best way to keep a produce is by respecting its nature, like iceberg, instead of cutting to pieces, if it is eaten peeled by leaf by leaf, the inner leaves will remain fresh and the vegetable will endure more or carrots which will remain fresher if they are kept under sand, even better in humid sand. Also the problem of ethylene should be considered more, since it is one of the most influential provocateur.

THE SELECTION OF MATERIALS FOR STORAGE SHOULD BE NATURAL AND WELL VENTILATED.

The usage of plastic boxes and films are very common in fruit and vegetables industry. Airtight plastic packaging is being marketed as the best option for preserving the produces, but the produce should be kept in a breathable material with enough circulation to avoid etylene gas poisioning or dryness or some cases excessive humidity.

CONSUMERS SHOULD BE MORE CAUTIOUS WHILE THEY ARE SHOPPING.

The invention of fridge and the decrease in the cost of food has changed the shopping habits to be more impulsive. Impulsive and unplanned shopping, combined with the confidence provided by fridges, increases food waste. To stop this, the consumer should discourage himself or herself to buy more than necessary in the markets by preparing lists beforehand and being more cautious.

CONSUMERS SHOULD SEE BEYOND THE APPEARANCE.

The life cycle of the 'ugly' fruits are shorter compared to 'beautiful fruits'. They are not accepted by the supermarkets because they are not preferred by the consumers, so even though they consume the same sun, water and space, taste and hold the nutritional values exactly the same as the beautiful one, are being abandoned in the fields during harvest or thrown away in processing. The consumers should be educated to be more aware about these facts and the supermarkets should provide special offers (ex: France) in order to reintegrate the ugly produce to the system.

SUPERMARKETS HAS A GREAT POTENCIAL IN ORDER TO CHANGE THE FLOW OF THE SYSTEM.

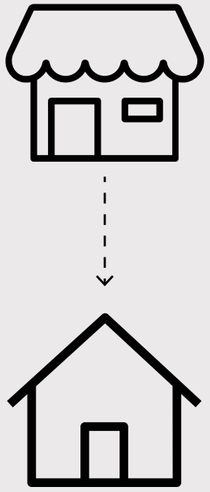
Although with 5% waste ratio, supermarket food waste seems the least comparing with the others, the supermarket itself physically plays a very crucial and strategic role in the lives of the consumers. Not every person has internet or like to do research about food, but everyone goes to a markets to buy food and spends a lot of time, it is a necessity. So the marketing strategies should be more sustainable and environmetalist, because they can make an impact on the 53% of household food waste also by displaying how food should be stored on site with real products.

Solutions //

THE GOAL SHOULDN'T BE JUST TO DESIGN A STORE TO SELL PRODUCES, BUT TO COMMUNICATE WITH THE CONSUMERS TO MAKE THEM EMBRACE NEW HABITS AND APPROACHES ABOUT FOOD AND WASTE IN THEIR DAILY LIFE.

The supermarket and the consumer are two inseparable steps that should work together. Educating the consumers will be the key to open the way to stop food waste. For this goal, the role of the supermarket is crucial. At the same time, the consumer's behaviors and preferences affect the functioning of supermarkets, so it creates a blind loop which should be broken soon enough.

The solutions for vegetable and fruit waste can be solved only by cooperation and education. The development can be achieved by a system of infographics with the correct in-store design and marketing strategies in a more sustainable approach to trigger the customer to be more aware and careful towards the lifespan of the edibles.



Groceries + What?
List of things to take back home

- Information about the origins of the produce
- Informations about how and where to store produce
- Correct packaging with correct number of items inside
- Knowledge about the impact of humans on earth and to each other
- Understanding of every product is beautiful regardless of its looks
- The reasons why you should not waste food

FOR SUPERMARKETS:

Although with 5% waste ratio, supermarket food waste seems the least comparing to the others as explained before **the supermarket is a very influencial establishement on the previous stages waste levels. The market itself also physically plays a very crucial and strategic role in the lives of the consumers.**

The approach of educating the customers, adopting new methods for storing the produce fresher instead of stacking them on top of each other is more ecologically intelligent and economic rather than trashing or donating the edibles. So the major solutions can be;

• Displaying the correct storage solutions in the physical space, either showing on the arrangements or by making a small simulator kitchen for educative use.
•Re-designing the packaging in a more informative manner with more sustainable and natural materials also to avoid the usage of plastic packaging waste and also to discourage over-buying by limiting the space available.
• Making campaigns in order to sell the aesthetically deficient produces to contribute lowering the waste also in the primer stages.

FOR HOUSING:

Every consumer is concerned about food waste within their knowledge, either in respect to the ecological impacts or regarding the economical side effects. **Although the consumer is aware of the fact that sometimes the fridge is not the correct storage solution, leaving the fruits and vegetables on the counter also conflicts with the common routine.** In order to solve this custom, it is necessary to think the kitchen space with more space available outside the fridge for the produces, either as additional containers or as modular fitted kitchen element which should be,

• Designed specifically for each item, with the optimal displacement in order to take advantage of the symbiotic relationships between the fruits and vegetables.
• Less space to hold only enough produce or suggesting the maximum amount without limiting the user-experience in order to discourage the consumer to over-buy.
• Space to indicate the date of acquisition and also information about each edible regarding their life span. Also an additional stimulator to remind the consumer the end of life of the produce.

5

KITCHENS

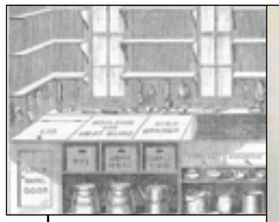
photo from the kithcen set of the TV serie 'Downtown Abbey'

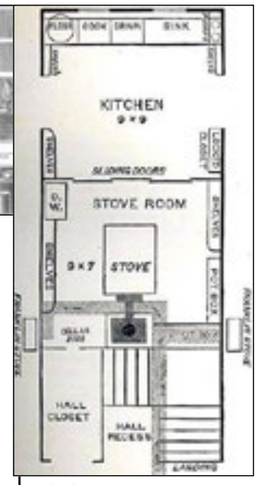
5.1 Kitchen Development Timeline

Antique Roman
Kitchen with stove and oven in a Roman Mansion in Germany

15th century
Drawing of the kitchen at Ashby de la Zouch Castle

18th century kitchen





1869
Cathrene Bleechers working kitchen

Industrial Revolution
1760 — 1840

Antiquity

SPACE

For the common people, the kitchens were either placed on the patio of an atrium- type house or there were large public kitchens for the community to cook. They used a stove for cooking.

In the wealthy houses, the kitchen is placed as a separate room, usually next to a bathroom (to make use of the stove heat in both rooms) or a room set apart for practical reasons of smoke and sociological reasons of the kitchen being operated by slaves.

STORAGE

In these houses, there were also additional rooms like antique cellars for storing food and utensils.

Middle Ages

SPACE /FUNCTION

The kitchen remained mostly unaffected by architectural advances throughout the Middle Ages; open fire remained the only method of heating food.

In the 12th century, chimneys were invented. The kitchen was sometimes moved to a separate building since there was no need to serve anymore to heat the living rooms. For the servants, there were separate stairs to never come across with the habitants of the house.

All manner of life revolved around the cooking area, which was the primary source of heat, light and safety.

STORAGE

In castles and large homes with cellars, an underground room could be used to keep foods packed in winter ice through the cooler spring months and into the summer. Moreover, the vegetables were also preserved by layering them in salt and placing them in a sealable container such as an earthenware crock.

18th century

SPACE

For the wealthy, they were large kitchens with a lot of servant working for elaborated dishes and formal table settings. The kitchen is situated outside the house, used only by servants.who were responsible of cleaning the increasing amounts of cutlery, dishware, gadgets and ovens.

For the common people, the kitchens weren't too different than before in which all the activities were held in one common hearth, its the place of cooking, eating, socializing and even sleeping. to take advantage of the only heat source, thus the hygene levels were lower compared to wealthy families.

STORAGE - FIRST REFRIGIRATOR

As seen in the photo of a remodeling of an 18th-century kitchen, it was a popular approach to hang the fruits and vegetables to the ceiling to keep them ventilated and away from rats.

In 1748 William Cullen developed a process for creating an artificial cooling medium which was the first attempt to create a refrigerator although no one was interested.

19th century

SPACE/FUNCTION

Servants and women would spend their time in the kitchen which was a space left hidden. For the majority of the population which is poorer, the kitchen was a multifunctioning area which the occupants ate, worked, washed and even slept. Hygiene levels were lower in the second case.

WORKING WOMAN & KITCHEN

The women with the increasing cost of life needed to start working in the factories to help the family thus creating too much fatigue combined with the workload of the house. In response to these problems, Cathrene Beecher in 1869 designed the ideal kitchen which she organized the workspaces in; storage, preparation, and cleaning to fasten the workflow of working women.

STORAGE - FIRST COMMERCIAL FRIDGE, SHELVES

With the industry developments, one of the first commercial refrigerators designed and put on the market but still wasn't popular, in the design of Cathrine Beecher there is also the storage space designed for each item in the kitchen.

1 Snell, Melissa. (2017, November 20). Medieval Food Preservation. Retrieved from https://www.thoughtco.com/medieval-food-preservation-1788842

1901

Peter Behren's kitchen design, the curve motive continious all through the house including the kitchen

1900s

1905-11

Joseph Hoffmans kitchen in the Palais Stoclet, Traditional large working table, all white and covered with tiles up to ceiling for hygenic reasons.

World War 1

1914 1918

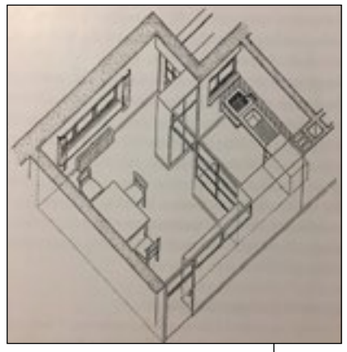
1910s

1927

Erma Meyer's 'Stuttgart Kitchen'

1927

Frankfurt Kitchen



1928

Munich Kitchen

1920s

SPACE/FUNCTION

At the beginning of 20th century, the kitchens were furnished with a free standing stove heated with coal or wood, permanent sink, rows of lined shelves with lockable cabinets to store the kitchen utensils and tables as a working surface. In a typical floor plan, the living rooms would be oriented to the street, the less important and more private rooms like bedrooms, WC, and kitchen would face the courtyard. Hygiene and nutrition have started to be given importance; the kitchen has become a facility of work under the orders of the lady of the house.

Although the general approach by the architects to place the kitchens on the ground floor to separate it continued, with the arts and crafts and art nouveau movements, the kitchen furniture was started to be integrated more to the general decor scheme of the house.

For the working class the beginning of the century was not so different than before, all in one room, communal living, even they had to rent their beds and make shifts for sleeping.

FRIDGE/STORAGE

Iceboxes of all sizes are made of everything from wood to metal and are how people keep their food fresh. The iceboxes are often located on a back porch or hallway with a door to the outdoors to provide the iceman and milkman easy access.

SPACE/FUNCTION

Middle-class kitchens begin to resemble the kitchens of today. They contain a sink, stove and icebox, but are still located in the workroom of the home.

The tradition of keeping the hygene in high levels continued, with the easily cleanable tiles, completely covering walls and the dominancy of white color to notice better the dirt and spots.

AFTER THE WAR - ONE KITCHEN HOUSES

After the World War 1, the mass unemployment, economic depression and housing shortages, pushed the architects to think about a solution for the mass housing for the first time.

The individual apartments with a communal central service unit was one of the first solutions. The idea was proposing to share the kitchen space thus share the house choirs like cooking or raising children. The diversity of circumstances of each family caused the collapse of this system except the Soviet Russia which hinders divertsity with the communist regime so supported the communal kitchens.

FRIDGE/STORAGE

Fridges and other electrical kitchen gadgets were starting to get popular. But there were still not enough electricity so the ice boxes were still prefered. For soldiers to store the food longer during the war, drying, canning and pickling tecniques for food storage were popular.

SPACE/FUNCTION : MODERN KITCHEN

The modernist architect embraced the development of kitchen because their ideas which criticized as being cold were finding a functional meaning with the reorganization and mechanization of the kitchen. New floor plans followed the idea of one room one function thus separated the eating, sleeping, cooking and washing activities.

'Housewife and architect should be in systematic collaboration' said Erna Meyer who released a lot of ideas about the new kitchen and also exhibited **'The Stuttgart Kitchen'** which in contrast to built-in kitchens was customizable for different sizes.Erna Meyer influenced also Margarette Schütte-Lihotzky the designer of the **'Frankfurt Kitchen'.**

Reflecting the physiological principles and her own experiences in housing design, Margarette Schütte-Lihotzky managed to design the 'Frankfurt Kitchen'. It was the first fitted kitchen, separating the kitchen space from the rest of the house, introduced into working-class households which were a privilege only available to the bourgeois. The Frankfurt kitchen was a narrow double-file kitchen measuring 1.9 m × 3.4 m, calculated by the possible movement and studying of the work processes, also considering hygiene and ergonomics.

After the Frankfurt Kitchen, the general architectural ideology for kitchens continued in the direction of dividing the cooking and preparation, work area from the living area. Adolf Loos was one of the modernists who defended the idea of living in the kitchen. According to Loos, it is good to have an audience while working, separating the kitchen from the living area is like secluding the housewife from the family itself.

As a response and solution to these different sides, Erna Meyer designed the Munich Kitchen, which was dividing the kitchen space and the living room with a glass wall, creating a balance while separating the function physically, visually keeping the contact.

STORAGE: REFRIGIRATOR, CELLARS, ICEBOXES

The first refrigerator to see widespread use was the General Electric "Monitor-Top" refrigerator introduced in 1927, around the end of 20s other models also popped up and with the invention, but most people were still using iceboxes because of electricity and costs.

The cellars were still existent, located in the basements of the houses, darker and cooler to extend the freshness of the food. Another storage solution was, hanging the food especially meat inside the water weels since it was colder.

1942
Elektrolux fridge commercial

1954
Industrialized kitchen

World War 1
1939 1945

1930-40s

SPACE/FUNCTION
After the World War 2, the general approach shifted more to the technological and mechanical improvements in the kitchen. The United States was more developed than Europe, with their rational kitchen organization, appliances placed according to the workflow of the user. Even though there was a wide range of technological appliances to help the housewife, the time spent by the women in the kitchen hasn't decreased. The new houses were too rational, cutting the recreational areas and inflexible.
Material wise also the usage of natural materials has left its place to plastic surfaces, easier to clean, white colors, linoleum for floors, to be hygienic.

STORAGE: FRDIGE, FROZEN FOOD,ONE TIME SHOPPING
The appliances that were more inferior and more expensive during the 20s that no one can afford has become reachable in the 50s and 60s including the fridges, in fact, refrigerators and frozen food storage become widely used and accepted as an unthinkable part of the kitchen. The idea and application of food preservation after this point changed immensely. The pantries and cellars were used less and less, the habit of daily shopping left its place to once in a week shopping trips that the consumer can afford easily with the spreaded car usage. The kitchen has become a laboratory to eat a frozen spinach and canned pasta.

1970
Luigi Colani's Experiment 70 for Poggenpohl Kitchen company

1974
Coop Himmelb(l)au's deconstructivist Mal-Zeit kitchen for EWE.

1950-70s

SPACE/FUNCTION
As a reaction to years of pure whites, while keeping the same layout, bright, colorful options emerged. Color isn't just on walls and floors either. Fridges, sinks and ovens come in shades of blues and pinks and bright yellows and greens. In the 60s there were other appliances like dishwasher and microwave, have been invented, so the job of woman decreased more and more.

STORAGE: FRIDGE, SHELVES,CUPBOARDS
With the continuing abundance of food, usage of fridge continued. With kitchens becoming wider, there was plenty of storage space added, but the people of this era preferred to use the refrigerator since it was the greatest innovation of the time.

THE EXPERIMENTAL APPROACH
Some architects were rejecting this modernist cold approach arguing that the sterile and monotonous spaces made with the functional design is serving only the building interests and ignore people's emotional needs. So they started to focus more on the elements of flexibility, mobility, variability, even considering the ideas and wishes of the resident throughout the design process.
Some of the visionary designs were, 'The experiment 70' which is a sphere kitchen by Luigi Colani based on the ideal kitchen of future, everything controlled by buttons, or the 'Mal-Zeit' Kitchen by Coop Himmelbau which were searching the ways to open the kitchen idea and make it rather than task an enjoyable activity. Soon again these type kitchens were also started to be considered uncomfortable, the well equipped but very small kitchennette was lacking enough space to enjoy the kitchen experience.

1980
Open kitchen plan from the 1980s House Beautiful magazine cover

1984
Snaidero's fitted kitchen with an additional island

1980s -

SPACE/FUNCTION
In 1982 with the book 'Kitchen for Cooking' Otl Aicher, introduced back the idea of connecting the kitchen to living room and the revitalization of the central kitchen idea with additional elements like an island work area which marks the beginning of 'Kitchen Island'. The kitchen has slowly become a part of the living areas again with the open plan and flexible arrangements it started to convert from just mom's domain to the heart of the home, where everyone in the family gathers together which leads to an increase in size. More man was becoming involved in the process now with the increase of technological gadgets. The kitchen has started to become a showcase, described by Klaus Spechtenhauser as 'Ultimitaly the increasing aestheticization and formalization of the kitchen reflects a social continuity, everyday dining is increasingly becoming a minor activity located outside of the home.'

HYGIENE
The floors were ceramic tiles or linoleum, electrical vacuum cleaners and other advanced chemicals to make cleaning easier.

FRIDGE/ STORAGE
In the 80s and so on, the plastic usage that had begun around 50s has increased, the Tupperware was very popular for storage, and the size of the fridge got bigger since the frozen food's dimension has become meal size with the invention of the microwave.

Current Kitchen & Food Waste

The problem of food waste in the household is mainly due to the wrong storage of the fruits and vegetables as covered in the previous chapters. With the technological advancements, the once daily and useful storage methods, such as cellars, with the area reducement in the living spaces and changes in lifestyles are getting extinct with the dominance of refrigerators.

According to a small survey conducted in between 100 people for the thesis development, showed that almost everyone stores their vegetables and fruits, regardless of their characteristics, inside the refrigerator. Among the reasons we can count, lack of space, misleading advise from elderly family members or the wrong display in the supermarkets. Throughout the development of kitchen, the considerations were focused on, the user comfort, human ergonomy, hygiene, how to include technology in kitchens and daily life. The interest was on the preparation and eating stages, more than the disposal or prevention of waste. Since food was in abundance, food waste was rather invisible. After fridge and the invention of plastic containers, the re has not been a significant improvement and does not get much attention also, without knowing where the food is coming from, it makes it easier to throw away.
More than any other room of the house, the modern kitchen has become a space which is full of technological gadgets almost like a laboratory as the prior kitchen designers have aimed for. Other than the appliances that the consumers have one each for every possible activity, the upsizing of fridges is the primary waste generator and booster of the energy usage. When the refrigerator gets bigger, the user tends to fill it, so s/he buys more and often the vast part of this excess food gets forgotten and goes to waste. So more directly; The consumer spends electricity to keep the food fresh for future disposal.
For a possible solution, the next pages are dedicated to the necessary study of today's kitchen. As a company who is the most popular and economically reachable among the market with its quality-price balance and its practical solutions, IKEA is a significant leader in the kitchen market which is the reason it has been chosen to conduct a kitchen space study based on the IKEA kitchen solutions.

5.2 IKEA's Approaches on Design and Kitchens

This section is a collage of different interviews made with the heads of IKEA's design and research departments, the aim is to understand their vision, process of design and ways of gathering information. .

Research Manager of IKEA, Mikael Ydholm leads a team that visits thousands of homes annually (the CEO participates sometimes) and compiles reports from trend spotters and experts that look as far as a decade into the future. (1) They visit customers, producers, schools make researches, interviews, and observations on how they live the space or share a room. The researchers even stay with the testers to understand better the users, although designs slightly change depending on the culture and habits of the countries, their prior principle is 'Democratic Design' which means design available for everybody's use. Even though these data are not public, they transform this accumulation of knowledge into their prototype rooms in their stores to give the people solutions for small and compact spaces in their possible houses.

In an interview in 2013, IKEA Creative Director Mia Lundström said, 'Kitchens, are increasingly becoming a showcase for homeowners, no matter where they reside. "We want to show off our pots and pans," Over the past three decades, she said, kitchens have transformed into "the new living room." She estimates that 70% of shoppers, now dream of having an island in their kitchen, a place where party guests gather to watch the cook at work, children sit to do homework, and the family enjoys many meals. With the actualization of this observations and data, we can come across in the catalogs and stores, such as the kitchen photo from 2014 IKEA catalog where the family is all together in the kitchen enjoying their time together.

In 2015, the chief of design department of IKEA-Marcus Engman said; "When you go deeper into the research, you can see that people actually choose to live in small spaces, because it's smart. It's more energy efficient, and if you look at your home and what you really need regarding space, you can see that 90% of the space you have in a normal home is not used. It's just a few square meters that you use a lot, and some of the square meters that you use time to time, what we're talking about right now is what we call the 'fluid home, everything in one room. Thinking on an activity basis instead of room basis, and lots of activities occurring in the same room."

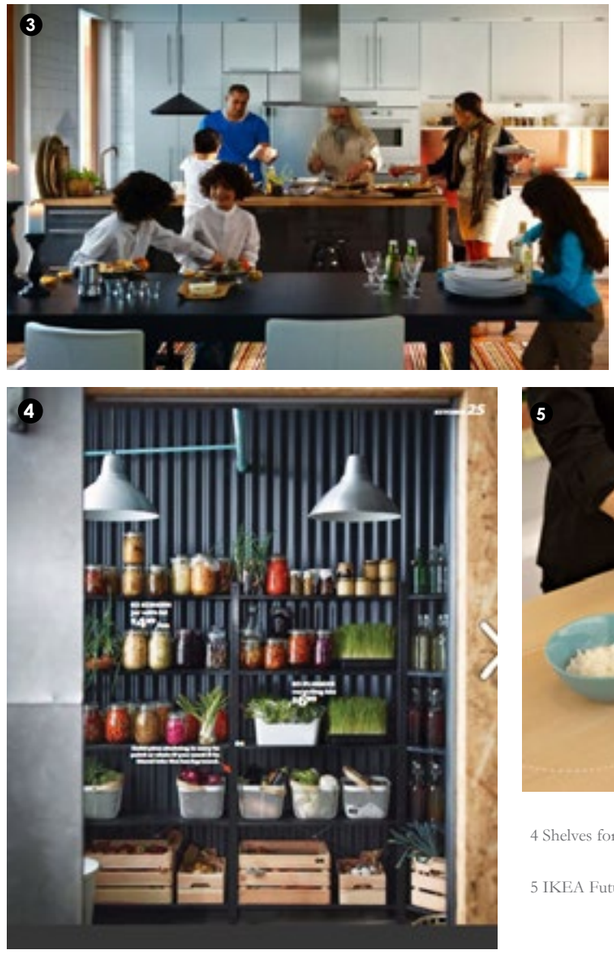
This approach also brings forward the kitchens come back as the heart of the house is also visible in the 2016 catalog when for the first time, a kitchen was on the cover and explained detailedly inside beginning from the initial pages (which generally kitchen part starts after 70-80th page) there are advises on kitchens and even about storage. The vegetables and fruits that we see inside the fridge in the previous catalogs are placed outside, in separate containers and carts. This year in 2017 catalogue, there are even a seperate pages about how to cut food waste in kitchen with IKEA products which is another proof that also IKEA is aware of this great problem.

In the EXPO of 2015, IKEA displayed their prototype future concept kitchen in Milano, Via Vigevano, they introduced different ways of storing the produce, like instead of frdige the root vegetables were in a terra cotta drawer or other vegetables were placed in wicker baskets. Moreover the design has managed to unite main kitchen activities like preperation and cooking with supportive functions like searching for recipes or asking advises to your mother, on one table. So the two conclusions from IKEA's future are; multi-tasking furniture items and new storage solutions along with recycling and ergonomic developments.

1 Kitchen with special solutions for vegetables and fruits. 2016 catalogue

2 The Cover of 2016 Catalogue

3 The living kitchen. 2013 IKEA catalogue



4 Shelves for food storage. 2016 catalogue

5 IKEA Future Kitchen Table

THE CASE STUDIES

IKEA conducts very detailed reasearches on the life styles and apply the data they acquire on their designs and on the example spaces, to increase the quality of life of the users, and also other than kitchens itself, in the stores it is possible to examine also the connection between kitchens and the rest of the house. The success of the company is their talent in processing data to real spaces with universal design principals.
The case studies were chosen from IKEA Corsico Store in Milano, knowing that they will represent the general Milanese IKEA customer's wishes.

The in-store designers preparing the new decoration, confirms that every kitchen has a story and research behind it, the settings are assembled according to the patterns of purchase in the located city and the smart IKEA solutions and suggestions for the use of spaces.

THE KITCHEN TYPES

The recent opening of the kitchen again to the living room and the general approaches towards food consuming, (as a social activity), has led to the increase in the popularity of Single Wall Kitchens, both in an open plan, or in a classic live-in kitchen, the general approach is to cover one wall with services like sink, oven, cooker, etc. Than a table which is taking the place of the kitchen island, to do all the other activities. Another employee tells that for every three linear kitchens there are two 'L shaped kitchens' sold which is also emphasized in the stores existing prototypes. Among the 30 in store example kitchens examined, is divided as,

- 18 of them are linear,
- 7 of them are L shaped,
- 4 of them are galley type and
- 1 is an island kitchen.

Other than the numerical data, the study is based on;

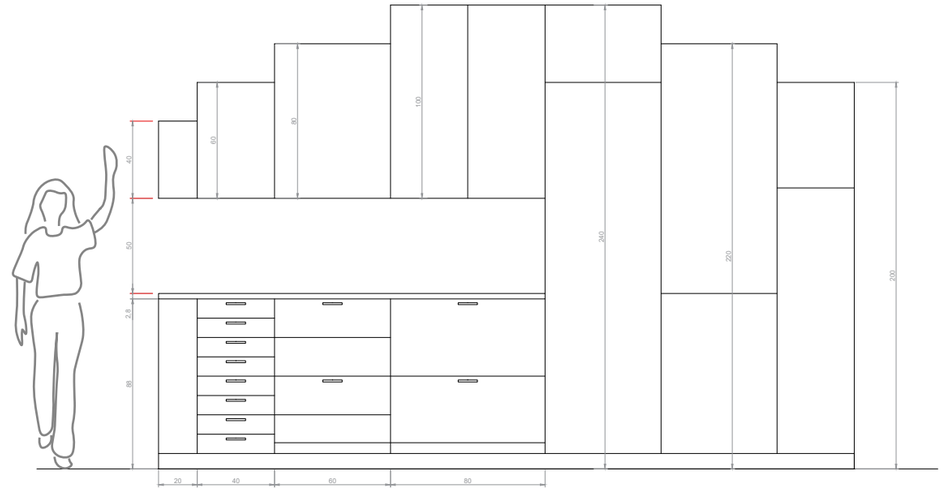
- The possible storage areas for vegetable and fruits, either they are enough or no.
- The utilities and their placement.
- The relationship between the rest of the shown house. (if exists)
- The work flow in the kitchen and how is the space usage.

MODULARITY

The modularity of kitchen furniture has started with Frankfurt Kitchen and continued to evolve since than. In IKEA, there are specific sizes (20-40-60-80 cm) for the customers to combine according to their necessity and wishes. After the planning, the items are shipped or taken by the customer to the houses and assambled on site by user.

The distanvantage of this standardiation is that it is not possible to customize according to the space itself. If the dimensions are fairly smaller or larger than the possible combination dimension, it can lead to the creation of spaces left unused that can collect dirt or the customer again has to think of a solution to the left over space.

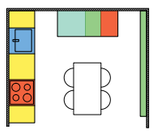
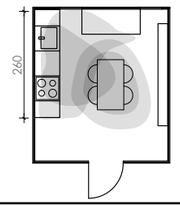
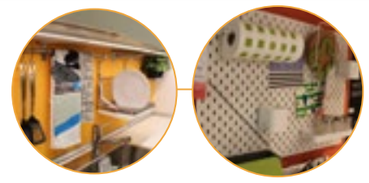
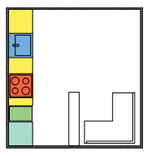
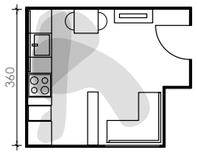
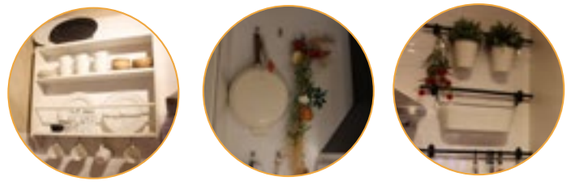
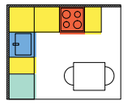
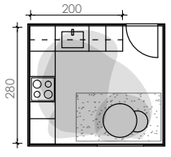
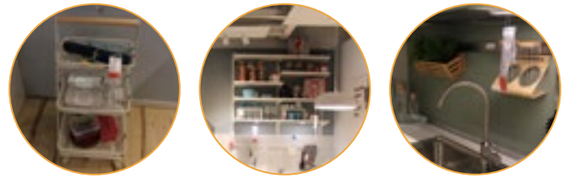
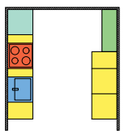
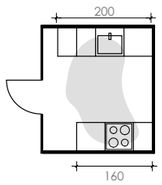
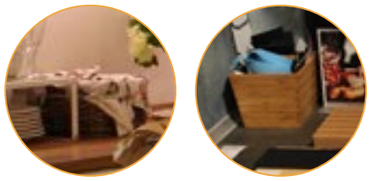
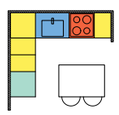
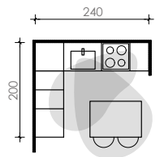
MODULES OF IKEA



THE DIMENSIONS OF IKEA KITCHENS

The generic modules are improved and personalized also with organizational products, dividers and specific storage ideas which will be covered in the next parts.

Current Examples from IKEA Corsico Store, Milan *

		AVERAGE CM	SELECTED EXAMPLE	FUNCTION/SPACE	FLOW DENSITIES	STORAGE SOLUTIONS FROM EACH CATEGORY
1 Single Wall	1.a Eat-in Plan	60 cm 60 cm 150 cm 60 cm		A more rigid division in between the living and the eating space. In all the examples there are also table and chairs which means the meal are eaten in the kitchen. Other functions including, preperation, socializing, working/studying according to the rest of the house. The examples gives the feeling of friendliness and gathering.		
	1.b Open Plan	60 cm 60 cm 130 cm 60 cm		The kitchen is included in the living space, all activities done together, in some configurations, they semi-divided the kitchen and the living space with shelving units, but the functions of kitchen and living is intertwined with each other; preperation, socializing, relaxing, working, eating.		
2 L Shape		60 cm 60 cm 260 cm 60 cm		Visible in two versions, included in to the living room with an open plan or as an eat-in configuration. The m² is higher so the movements and flow is more comfortable. The area is mostly reserved to preperation and eating activities, in larger cases there are bigger tables to guest more people and socialize. .		
3 Galley		60 cm 60 cm 220 cm 60 cm		Galley kitchen is prefered when the space is very tight or one of the walls has full windows so there arerestrictions, or in cases of multi usage of the space in order to create more area for the kitchen while supportin other activities. There are no table to eat, main activity is preperation, in a way its the upgrade of work kitchen.		
4 Island		60 cm 60 cm 220 cm 60 cm		Although Island Kitchen was a popular wish in 2013, in the store there was only one example which wasn't very efficient. The functions include, preperation and eating since the example was quite small. In the bigger examples a island kitchen is more of a gathering area to socialize and share a meal together.		

* The whole study can be seen in the Appendix Section.

Understanding the Kitchen of Today through IKEA Prototypes

The modern kitchen, based on the IKEA's prototypes shows us that kitchen and living space is very interlaced. Almost every prototype living space in IKEA, except the ones made explicitly for bedrooms or bathrooms, has a kitchen inside. The kitchen is very interlaced with the rest of the house and as expected, it is again the hearth of the home. Even if it is only a working kitchen, the ways IKEA found even if it is for storage are very creative and open to personalization, which is one of the strongest aspects of IKEA design. Putting on display what people typically have inside the cabinets as we see on the examples is a way of turning the space your own and passing beyond the cabinet color, it becomes a living scenography controlled by the user. The photos of the examples on the left which in plan format used on the previous page, shows us the variety of options.

There is plenty of new storage and gadgets but mostly used for utilities for cooking or the closest to an edible for herbs. Even though IKEA is consciousness about the food waste issue is visible through their publications, paper-based or online and in their cafeteria policies about cutting food waste, the problem is still invisible in the stores, unfortunately. There are several examples where the fruits and vegetables are used as decoration elements, but it does not go beyond. The capacity of IKEA shops influence on also educating people can be used in a better way, additional to the decoration and organization tips, the storage for produce can be shown in a more clear way, to give little hints about how easy it is to change with quick actions.

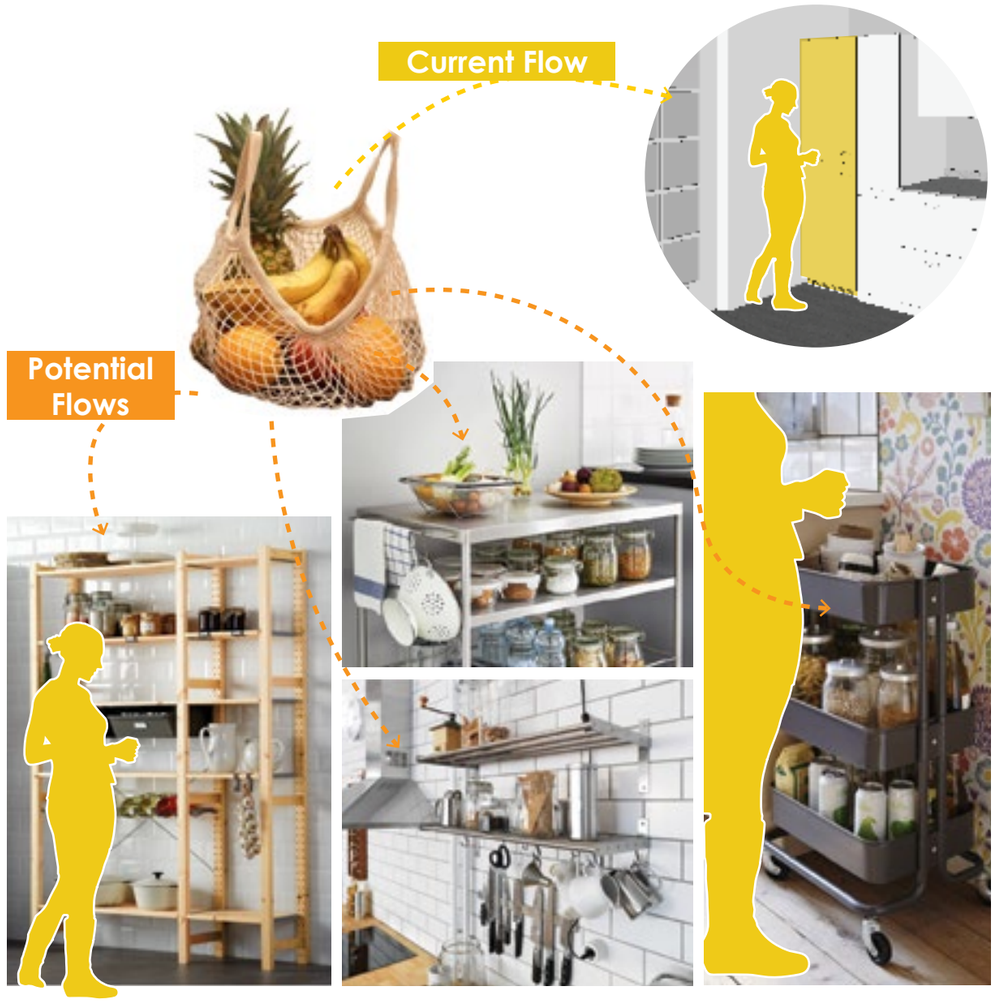
The next pages will continue with a more comprehensive study of the zones and components of the kitchen to understand which segments are available chosen to use for storage and how suitable these areas are for possible produce placement. The photos and examples are taken from the IKEA store in Corsico.

5.3 Space Usage for Storage

This part is about the storage systems and solutions that IKEA designed and applied on the example kitchens. For the correct storage of fruits and vegetables, which is the main objective of this thesis, it is important to understand where should they be stored. Right now the main flow to follow after grocery shopping is directly towards fridge although there are more possible places. There are many influences once the food is out of fridge like light, heat, wind, ventilation and most importantly how they should be placed, using which material, on the surface or hanged.

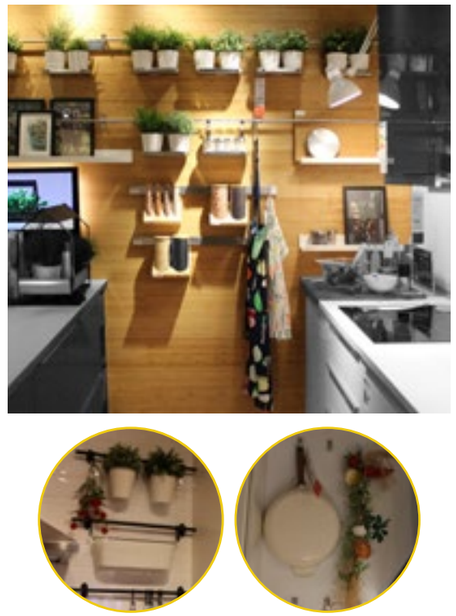
The possible areas of usage analysed through IKEA Kitchens are;

1. Walls,
2. Counters,
3. Carts
4. Additional shelves or shelving units.



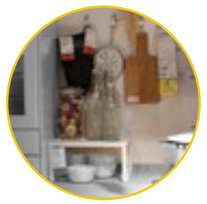
WALLS

Either a full wall or a 50 cm blank space between the counter and the cupboard like the examples are both fit to hang anything. There are many examples that can be find in IKEA, regarding the wall attachment systems such as small buckets for cutlery, magnetic systems for knives, tubular rods with hangers or even simple hooks. Attaching small and light weight items are easier but thinking about fruits and vegetable boxes, they will create a more obvious tension on the wall and the structure itself and making holes in the tiles might not be possible, so in this case a better option is using a self standing structure or hanging under the existing cabinets.
According to human anthropology, the top measure for placing the containers should be no higher than eye level; 150-160 cm and if the container would be a drawer even lower; less than 130 cm for quickly seeing what is inside. In the case of hanging fruits and vegetables can be higher as 180 cm. So in the example kitchen, either on feet or mounted on the wall the containers should be in the bracket of 50-180 cm which is marked on the scheme on the right with green.



COUNTER

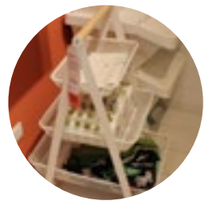
The counter is the horizontal work surface in kitchens or other food preparation areas. It is installed upon and supported by cabinets. The height of the surface differs according to the user, but the ikea dimension is 90 cm with the counter thickness. Although there is a huge variety of materials used in the countertop such as: natural stone, wood, metal, and so on, the standard measure of the depth considering the arms reach is 60 cm.
In this 60 cm, the 20 cm on the side of the wall is used as storage space for other accessories. So there is an available space already created with the user experience which is 20 by depth, 50 by height and changes in longitude.

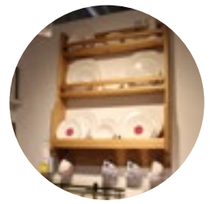


The storage area is the 20 cm of the counter starting from the wall. S

CARTS AND SHELVING UNITS

With the changing necessities, it is a comodity to be able to add and take off from the kitchen space. To answer the evolutions and changes IKEA has a lot of alternative solutions rather than the classic modular choice. There are carts and shelves or shelving units for all kind of needs. The shelving units are also modular in themselves so the user can customize them regarding the needs.
For the fruits and vegetables, some of the bookshelves like IVAR is also used as an alternative cellar. Their dimensions allow to store a lot of items and are more versatile and visible compared to the closed cabinets.
A shelving unit can be thought to store the produce as a modern cellar, next to the fridge, all cold and dry and vegetale storage put together in the same area in an organized way.





6

Containers

After the kitchen and possible storage zones, this section will focus on the fruits and vegetables. The fridge is not recommended for the major part of fruits and vegetables but on the outside of the fridge, it is important to recreate their optimal environment both to make them last more and to keep them in sight.

This section will cover the physical and chemical properties of the prduces. How are their dimesions, the seasonal changes and lowest and highest temperatures for their endurance.

Through out the year, with the season, fruits and vegetables change too. Eating seasonal produce is healthier and has a lower environmental impact since the transportation and agricultural carbon emissions are minimized compared to the produce coming from a greenhouse or the other side of the hemisphere. Another aim of the project is using the produce and its dynamic scenography while provoking and reminding the user to eat the vegetable before it's late.

6.1 Properties of Produce

Ethylen Sensitives	Pepper Eggplant Courgette Cucumber Orange	8-12 °C	85-90%	Terracotta Sand
	Carrot Green Onions	0-20 °C	95-100%	Sand
	Green Leaves	5-20 °C	95-100%	Water
	Garlic	5-20 °C	65-70 %	Darkness Ventilation
	Potato	10-20 °C	85-90%	Darkness Ventilation
Ethylen Producers	Pear Apple	1-15 °C	90-95%	Seperation Ventilation
	Lemon Tomato	13-20 °C	85- 90 %	Ventilation
	Onions	15-20 °C	65-70%	Darkness Ventilation
	Banana	12-14 °C	85-90 %	Ventilation

Aubergine, Zucchini, cucumber, green beans can be put together because they are all ethylene sensitives with the same necessary temperature of storage.
The same container fills up with oranges, mandarines, and kiwi on winter.

Carrots, green onions and turnips to be stored inside sand vertically to decrease their energy usage.

Green leaves roots should be placed in the water like flowers to hydrate themselves.

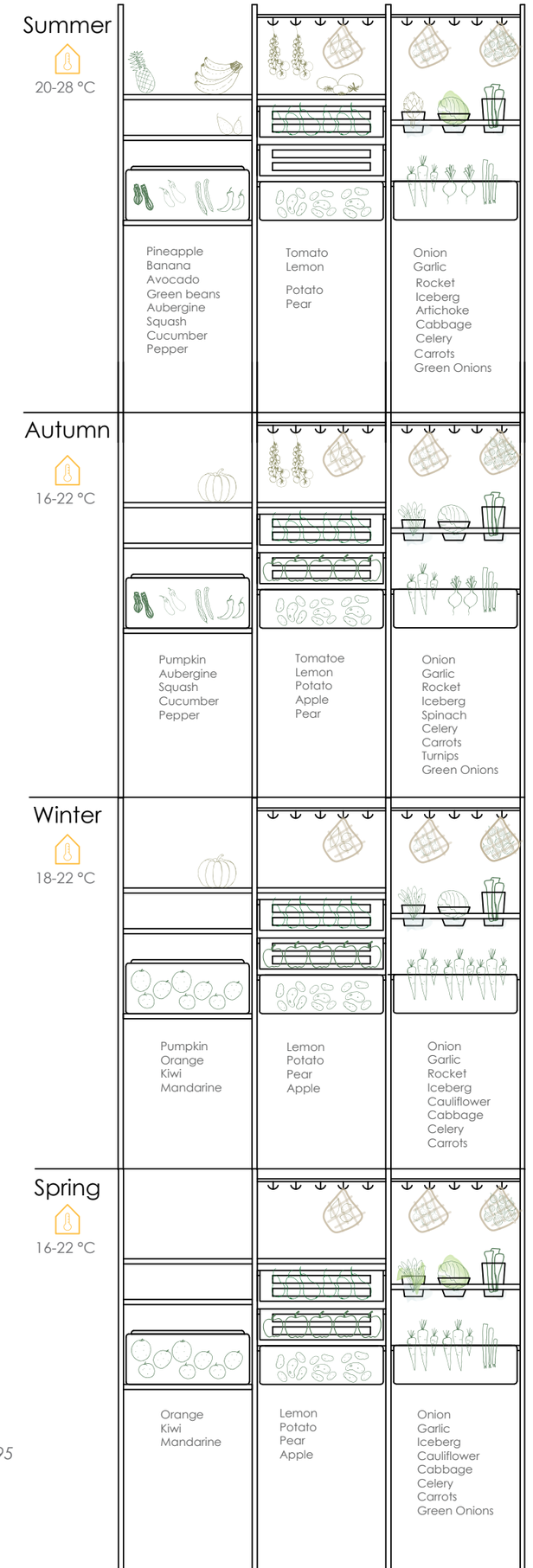
Garlic should be hanged and have to stay dark.

Potatoes, apples, and pears are together since the ethylene in the fruits keep potatoes shelf life longer.

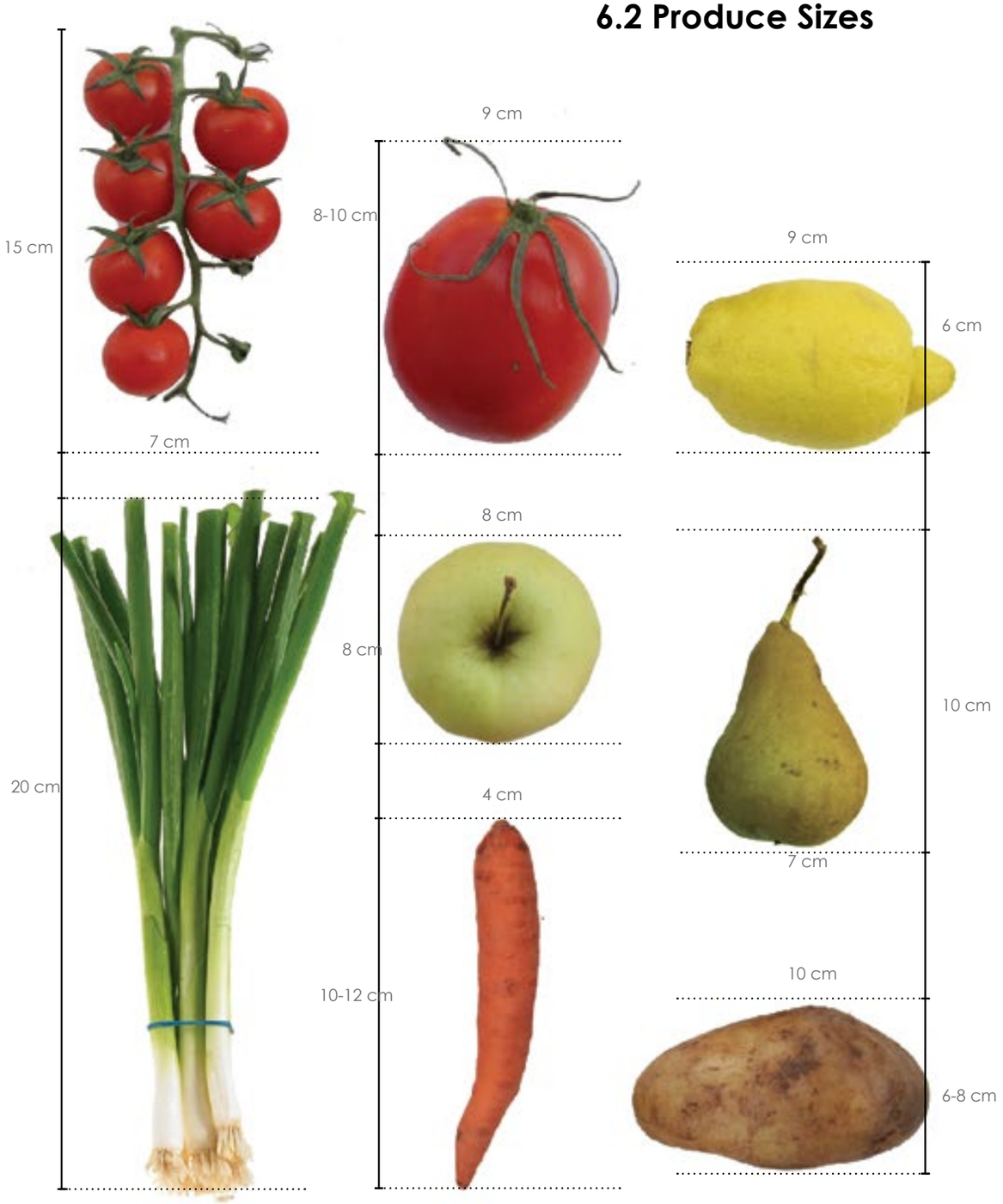
Tomatoes and lemons are put together because both of them has similar storage conditions; have to be hanged outside fridge.

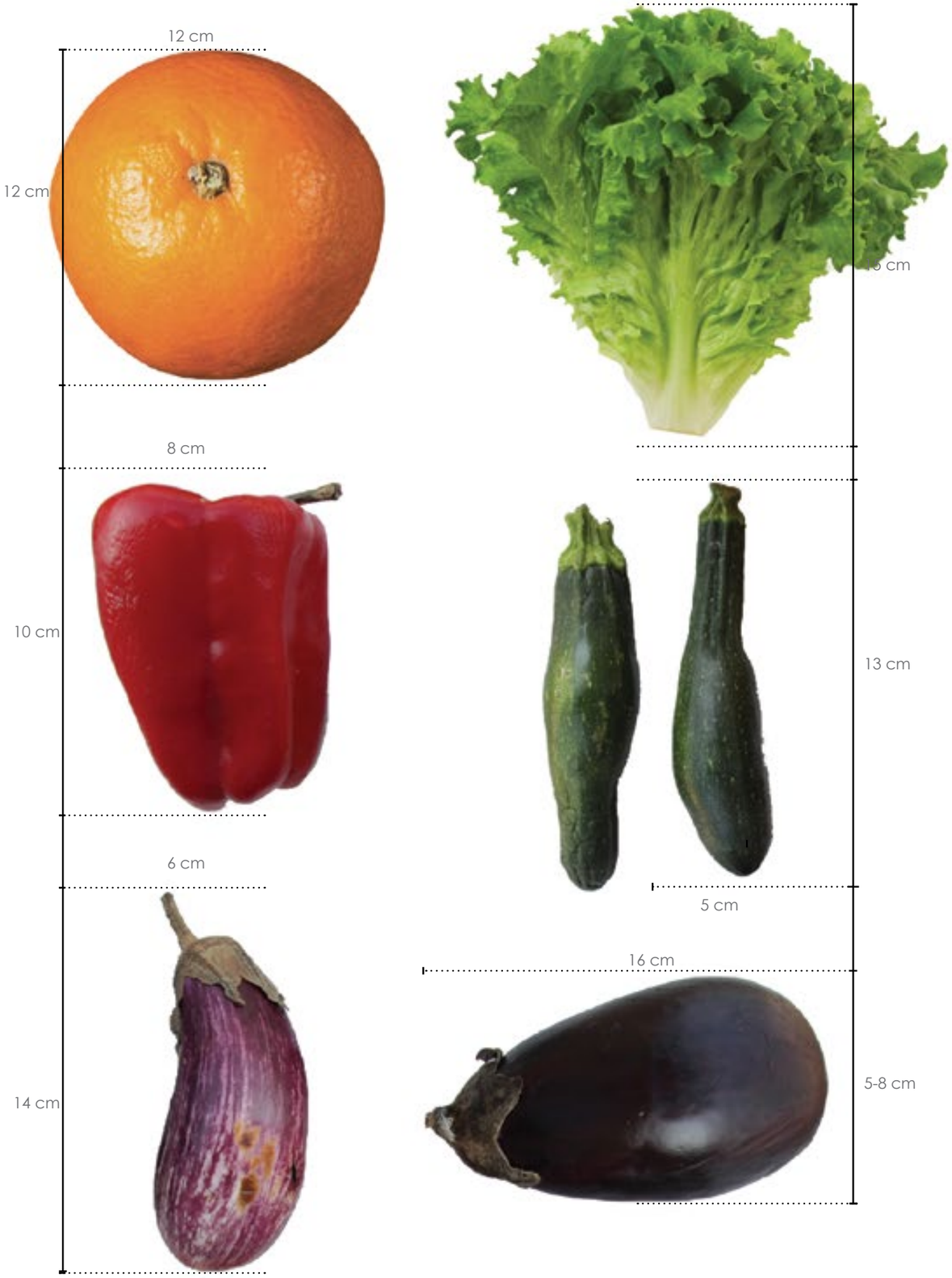
Onions have to stay in dark and ventilated, so hanging is the best solution.

Pineapple, avocados, and bananas are traveling a long distance from tropical climates, better for them to stay outside on a plate or a shelf, after they get ripen, they should be put into the fridge.

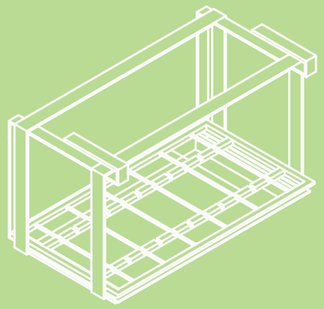


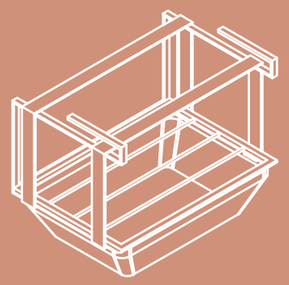
6.2 Produce Sizes

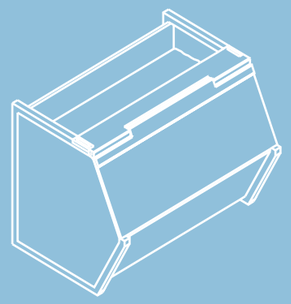




All of the fruits and vegetables are chosen from the left overs of the weekly market in Via Termopili, Milano.







6.3 Containers

Studying the kitchen has allowed underlining the possible areas available to take advantage of adding new accessories. **Among these groups, the more universal options are hanging from the already existing cupboards, putting the produce on the counter** and with shelves or an open cabinet, using an additional self standing unit. Hanging containers on the wall with additional apparatus is not very convenient, since not every house has the right wall to carry loads and it is additional work to assemble a ray in the wall.

This section of the project aims to design additional storage units to use outside the refrigerator for the vegetables and fruits that get damaged and forgotten inside the fridge.

The division of the fruits and vegetables according to their properties, has led to the creation of **four new containers to be added to the existing kitchen and a self standing shelving system.**

Two of them were made to put on the counter, almost the same form with different functions, terracotta containers to keep vegetables cooler and ventilated. Other two of them made with the principle of hanging under the already existing cabinets; the group better preserved hanged; tomatoes, lemons and the green leaves with a tray of water underneath.

The dimension of the containers was thought according to:
1. the possible available space in the kitchens and with the average dimensions
2. how many produce will one or two users need with the duration of one week.
3. depending on how long the expiration date of the produce, the bigger space it has in the containers; such as; the potatoes have almost twice as much space than zucchini and aubergine and pepper section since the second group has a shorter durability.

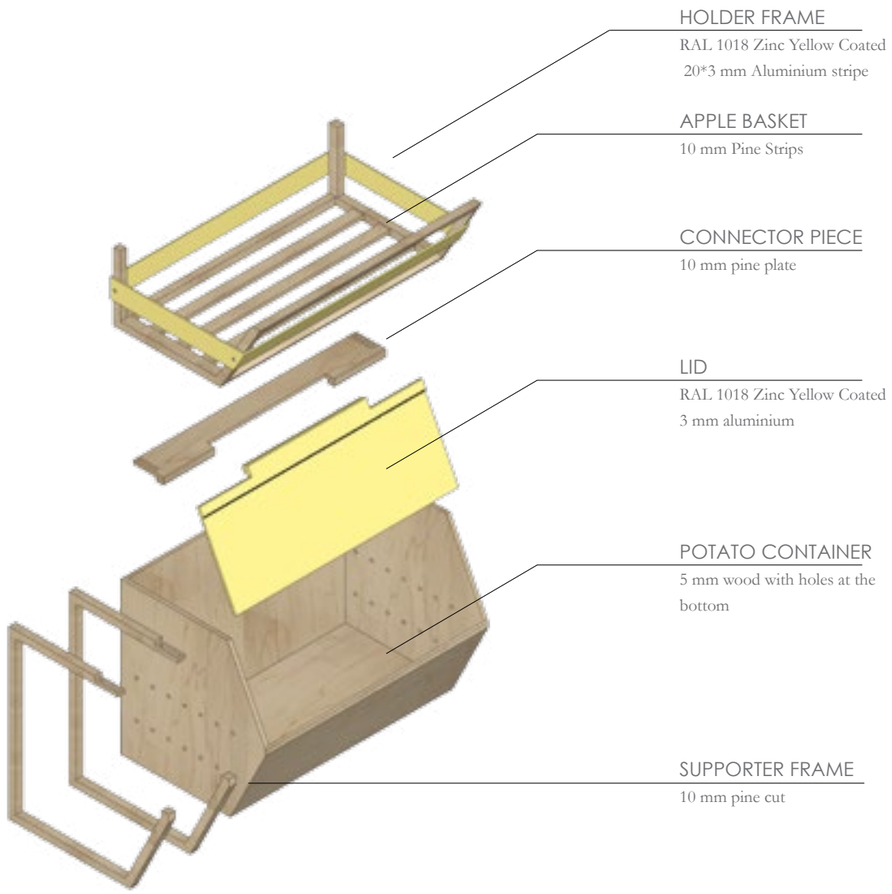
In this case the containers are divided also for different life-styles, either it is a family who eat 5-6 days at home or a single worker living alone, eating outside most of the time, how many times in a week the goes to grocery shopping and etc.

The shelving system is for the larger families with a capacity of more storage.

6.3.1 Pear - Apple & Potato

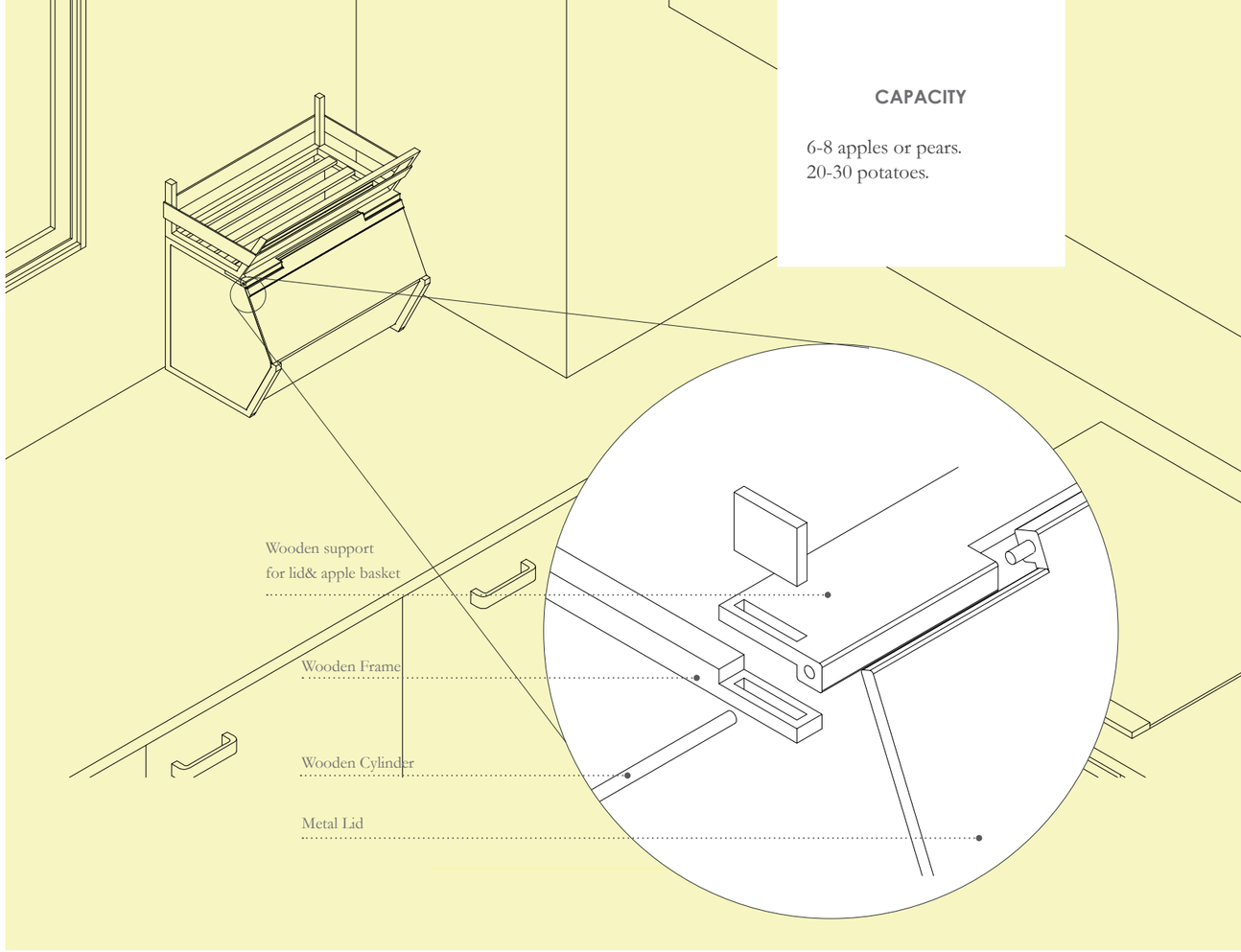
According to several studies, apples and potatoes have a good relationship when put together. Apples and pears are fruits with ethylene emission which prevent potatoes sprouting thus keeping them fresh for up to 8 weeks.

This container is to keep this three produce together in a symbiotic relationship. The bottom part is for the potatoes with the capacity of 20 item approximately and made from terracotta. On the outside of the container there is a wooden frame thought to support the upper wooden apple basket and the metal lid to cover the potatoes. The other opening angle of the container matches with the apple basket to achieve the gas exchange.



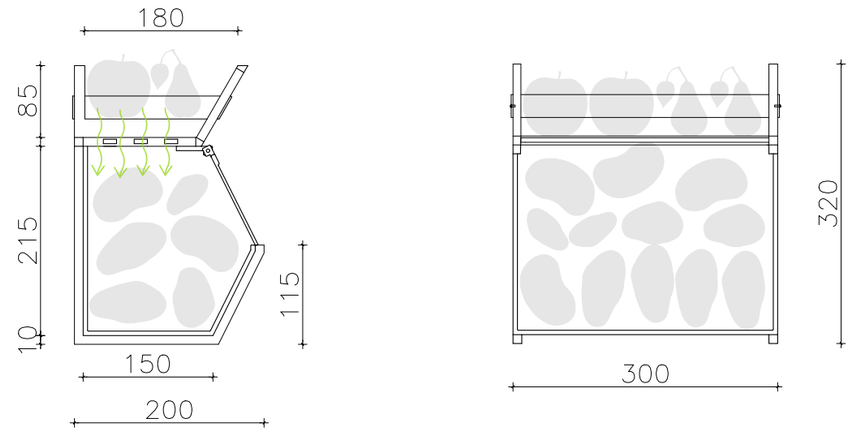
CAPACITY

6-8 apples or pears.
20-30 potatoes.



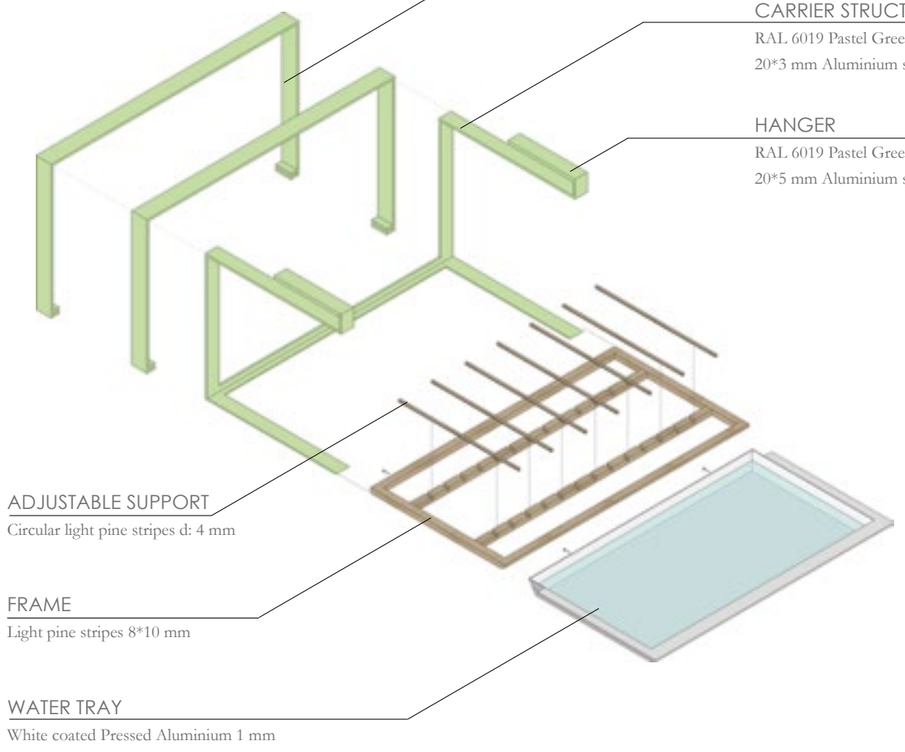
DIMENSIONS

The apple container made from wood and a metal stripe is completely open and can take 6-8 apples or pears. They have less storage area since the fruits are less enduring than potatoes, but the amount is enough to consume for a week or two, preventing rotting even in summer.



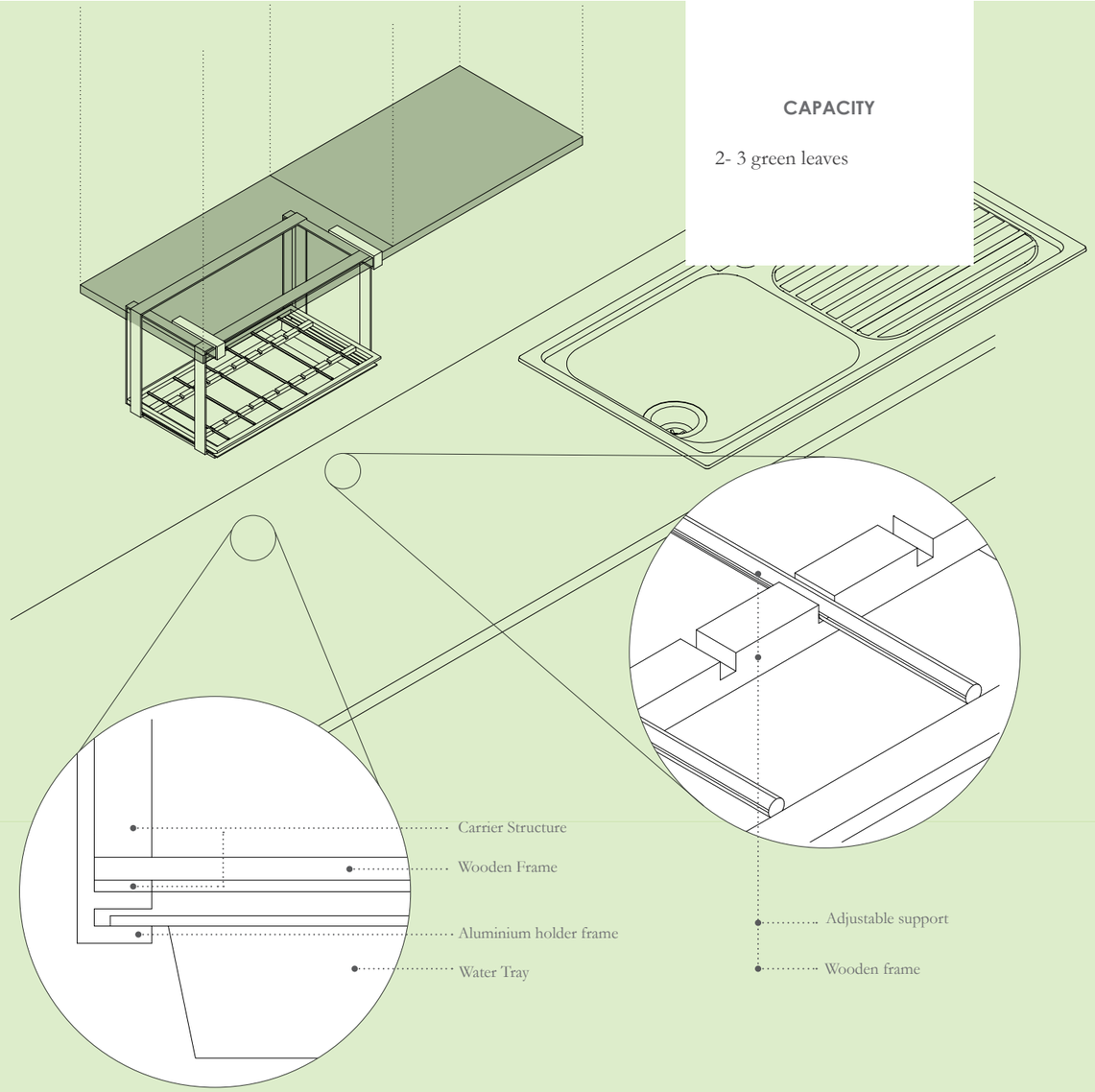
6.3.2 Green Leaves

The green-leaved vegetables, (iceberg, lettuce, rocket, artichoke, cabbage, and celery) should be treated like flowers, roots or the stems placed in water, staying hydrated while the leaves on top stay up and outside of water.
The green container consists of a metal frame allowing the user to hang under an existing shelf or to the bottom of the cupboards; a wooden net from unfixed wooden sticks so they are easily adjustable according to the size of the vegetable. And finally, under the net, a sliding tray to put and clean the water necessary for the roots, so without having to touch the produce, the user can change the water easily.

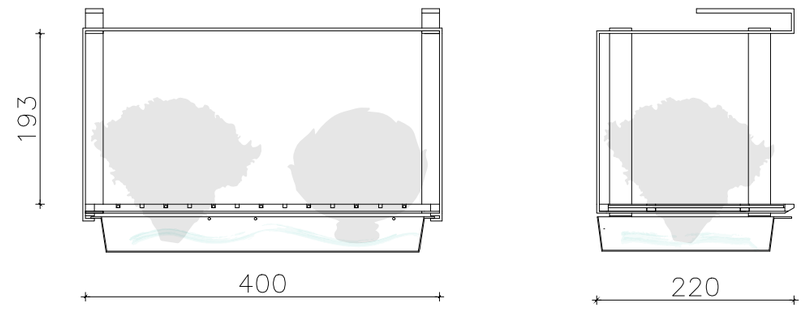


CAPACITY

2- 3 green leaves



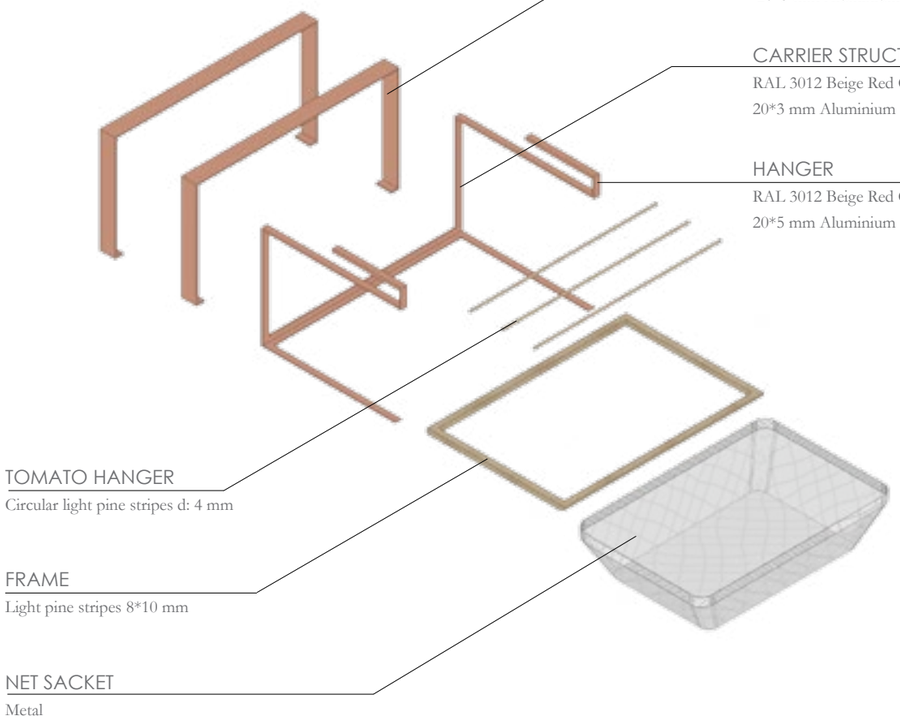
DIMENSIONS

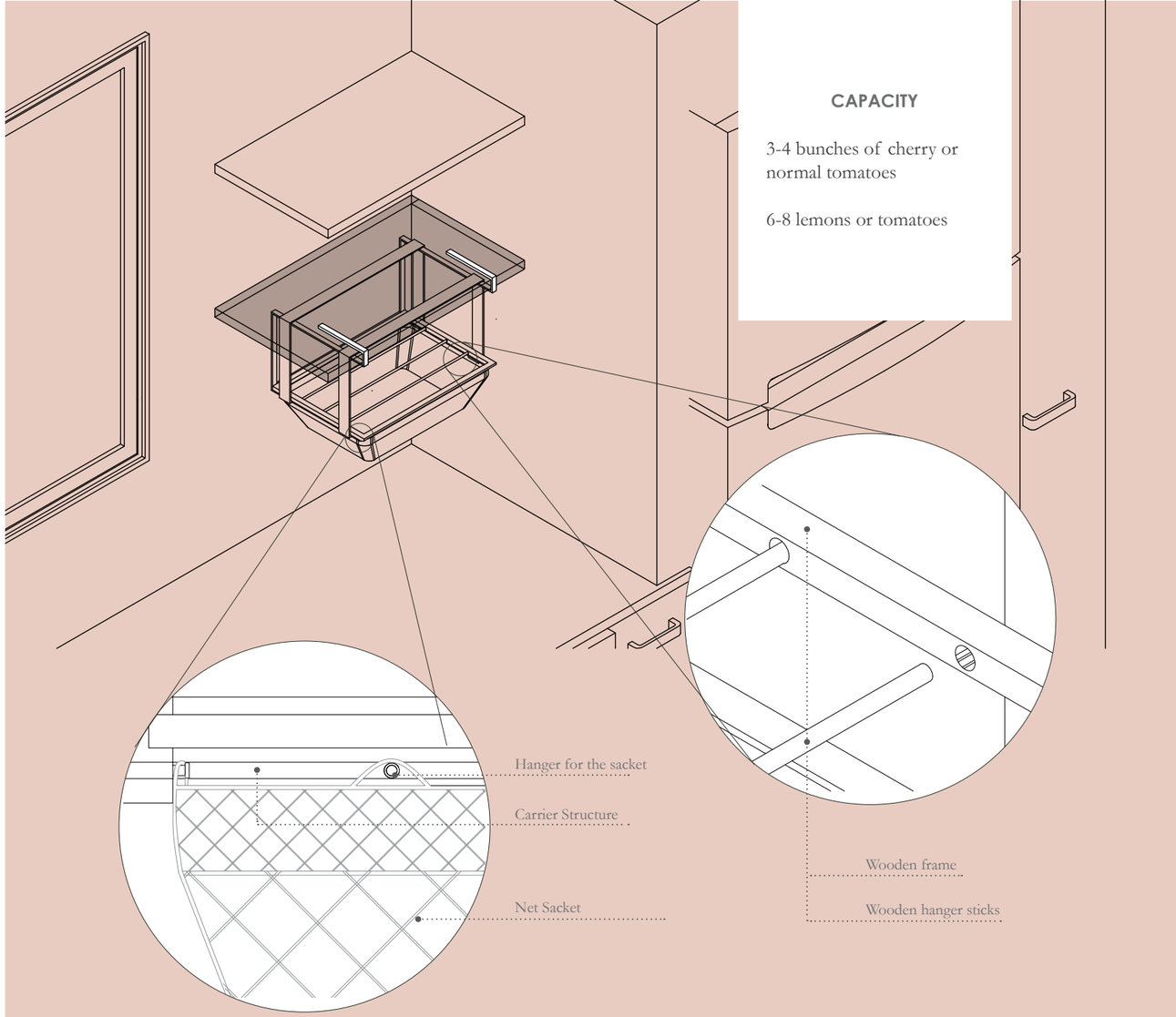


6.3.3 Tomatoes- Lemon

This container allows the bunches of tomato to be hanged which is the optimal condition. Tomatoes can be put together with lemons since they are both ethylene emissive produces.

The three sticks in the middle are to hang the bunches there is a net from metal to hold the pieces that can drop in time or for the pieces already plucked. On top, the place is aimed for the bigger tomatoes and lemons. So they will also be preserved hanged indirectly, getting enough air circulation. Under the wooden frame, comes a metal sacket, attached to the pins on carrier metal, this net is both to take for shopping and also to hold the pieces falling down from the bucnhes or the ones that are already fallen



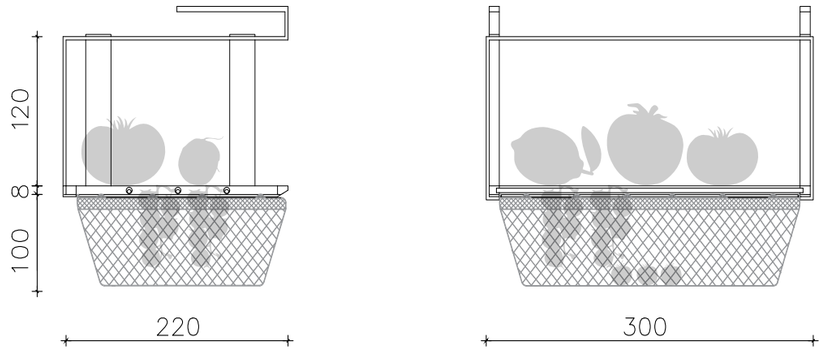


CAPACITY

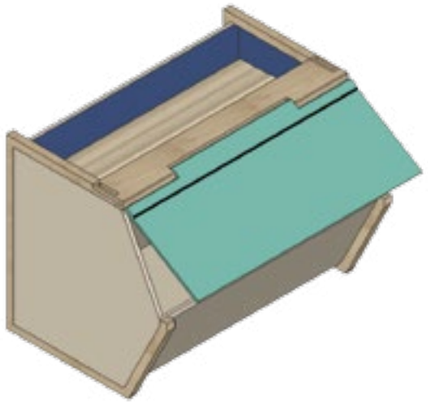
3-4 bunches of cherry or normal tomatoes

6-8 lemons or tomatoes

DIMENSIONS

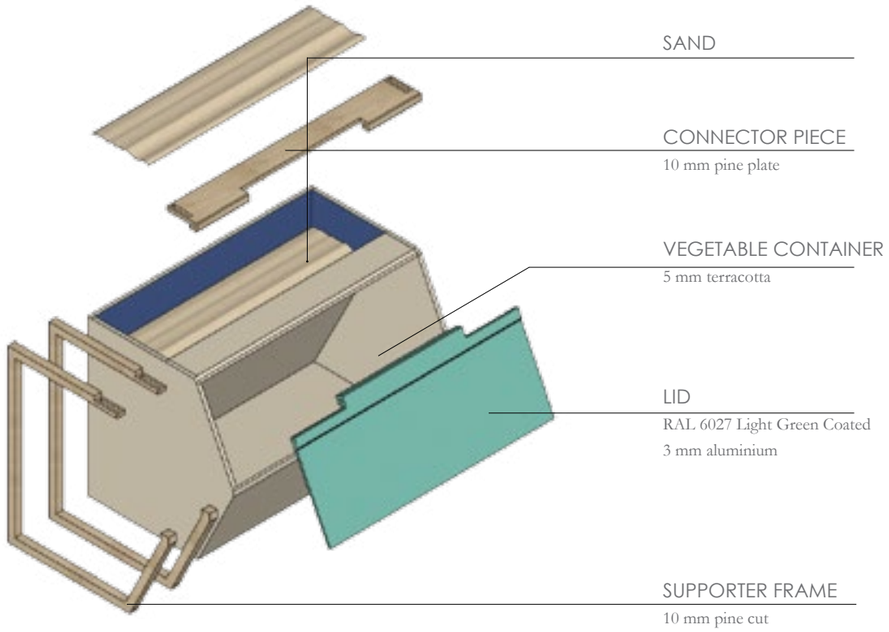


6.3.4 The Cold & Sandy Container



The container, although on the outside it is similar to the apple potato container, it is divided into two parts, the bottom part is for aubergine, zucchini, beans, and cucumber in summer whereas on winter it is used for oranges and mandarins. These are the vegetables, which are supposed to stay in a cold area but in refrigerator get chill burns, so this terracotta Zeer pot adaptation provides them a temperature in between, 7-10°C which is vital.

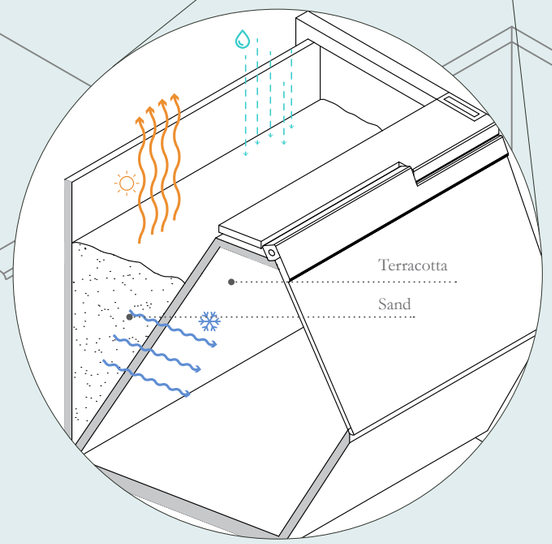
The top part, on the other hand, provides a fairly narrower space for the carrots, green onions and turnips (depending on the season) stored vertically, planted in the sand which should regularly be watered. The sand plays an important role for recreating the root vegetables growing environment, thus helping to keep them fresher for longer. After the user wets the sand, the evaporation process will contribute decreasing the temperature on the other part of the container.



CAPACITY

6-8 carrots
or 2-3 bunches of green onions
or 6-8 turnips.

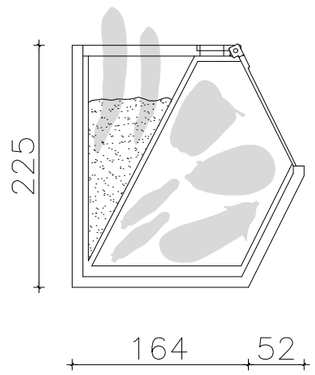
8-10 pieces from zucchine, eggplant, peppers or cucumbers mixed
or 12-15 oranges.

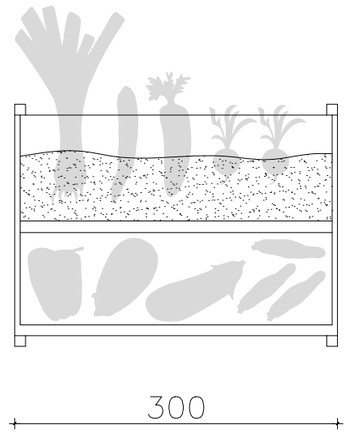


EVAPORATIVE COOLING PROCESS

As water is evaporated, energy is lost from the air, reducing the temperature of the environment. When the water in the sand evaporates, the terracotta becomes colder: this is a natural refrigerator system used by African merchants to keep their produce fresh, longer.

DIMENSIONS





6.4 Possible Alternatives from IKEA

PEAR, APPLE AND POTATOES

What is lacking in IKEA Containers?

• The possibility of putting all the item closer without contact is not possible,
•To keep the potatoes in darkness there is the need for another fabric.
•The baskets are bulky for counters limited surface.

Byholma - Rattan Basket

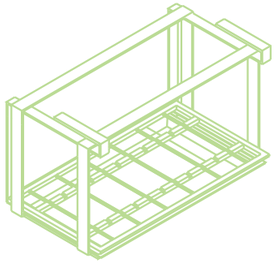
WIDTH: 25 cm
DEPTH: 29 cm
HEIGHT: 15 cm

• Hand woven basket, can create the dark and airy ambiante that potatoes need with a jute cover on top or by placing the apples.

RIMFORSA - Bamboo basket

WIDTH: 32 cm
DEPTH: 15 cm
HEIGHT: 11 cm

• The bamboo basket for keeping the apples and pears, it can be hanged or placed on a surface.



GREEN LEAVES

What is lacking in IKEA Containers?

• To change the water the vases has to be emptied each time
• Very fragile and bulky for counters limited surface.

What is more in IKEA Containers?

• The longer vases work better for longer vegetables whereas in the green container, there is a limitation to be fitted under the cabinets in order to not disturb the general workflow.

Begarlig - Glass Vase

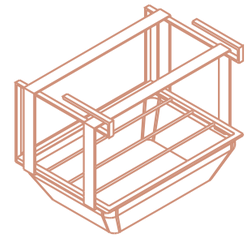
HEIGHT: 18-29 cm
DIAMETER: 13-19 cm

• This vase again can be used for longer green leaves like, celery or chard.

Tidvatten - Glass Bowl

DIAMETER : 26 cm

• Glass bowl can be used with water on the bottom, especially for the more rounded green leaves like; iceberg, lettuce or rocket..



TOMATOES AND LEMON

What is lacking in IKEA Containers?

• There is too much space in all of them, and since they are not made specifically for tomatoes, it is not possible to hang the bunches.

What is more in IKEA Containers?

• They can be used for also many other produces since the hanging option will provide adequate ventilation

KALLAX BASKET - Steel-Nickel basket

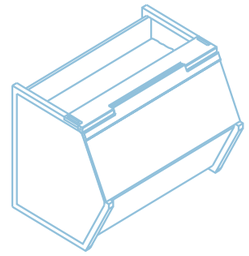
LENGTH: 40 CM
WIDTH: 33 CM
HEIGHT: 14 CM

• Only usable with a type of library, Kallax, initially though for papers.

OBSERVATOR - Steel Basket

LENGTH: 31 CM
WIDTH: 30 CM
HEIGHT: 18 CM

• To create more storage space in the existing shelves or libraries.
Is a good solution for many types of produce since it is open and easy to use.



COLD AND HUMID CONTAINER

What is lacking in IKEA Containers?

• The container is too bulky and only possible to put on the ground.
• It is not possible to take advantage of the sand in the middle for carrots since it is too small so there needs to be two different elements.

What is more in IKEA Containers?

• In case of more space necessary they are bigger than the cold and humid container so might be more useful an extra space.

Ingefara - Terra cotta Vase

DIAMETER :12- 20 cm

• The terracotta vases can go into each other with sand in the middle to create a natural fridge for the vegetables
• The root vegetables can be directly put inside with some sand again.

6.5 Additional Elements

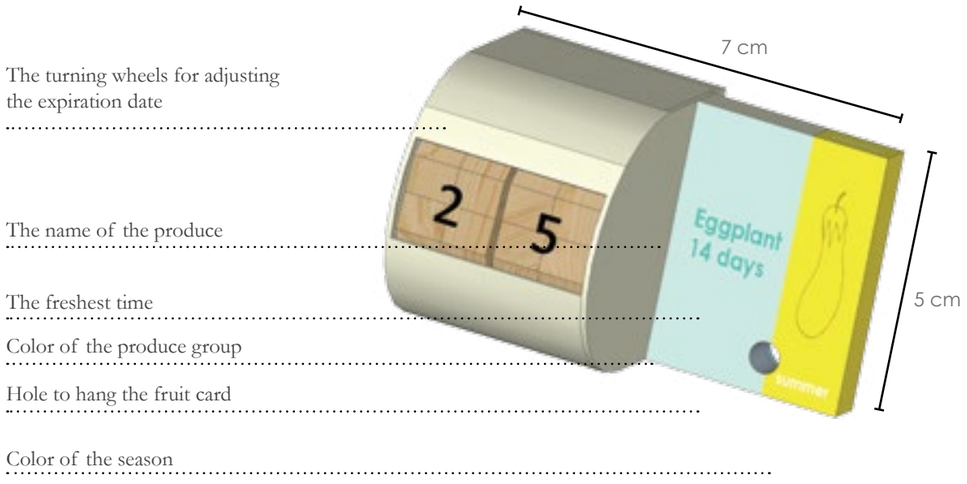
CALENDERS

Additional to the container, there are two other items in the project.

First one is a calendar which is coming from the idea of a padlock for luggage with the passcode, that the user has to put the right combination to open the lock.The working system of the calendar is with the same turning mechanism for numbers that are indicating the days of the month.

Each produce has a calendar designed individually with their name and the maximum time before they lose their freshness. So add the number written on the side with the name of the produce (which indicates the maximum freshness) to the date of acquisition of the product, and the user will have the expiration date of the produce.

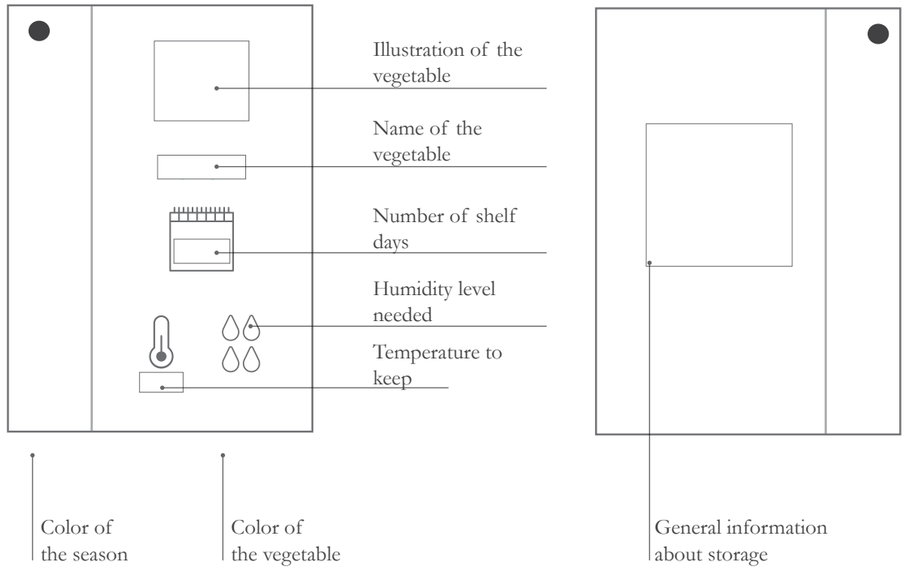
With the magnet at the back it is easy to adjust, attach and detach to the containers metal parts and for the refrigerated food, it can be used as a fridge magnet, reminding whats inside and how many days left to eat.



CARDS

The second item is a bunch of cards individually made for each produce. The aim of creating these cards is to explain where, how long and in which conditions the vegetable or fruits should be stored. It consists of again two colors, the color of the season to promote seasonal consumption and the color of the fruit's category to match quickly with the container.

The cards come altogether bound in a wheel, giving the user to separate them however, s/he wishes. Also, they are hangable to the calendar magnets.



7. Application

This section will explain the idea to connect the user to a better way of designing the kitchen and placement of the containers. The idea is through an application that will focus on the kitchen space's architectural condition like measurements, cardinal direction, openings, walls and existing kitchen type, placing of the fitted utilities like a sink, cooker, oven. The second focus will be on the user's life-style, how many times s/he goes to shopping, how many people eating together in the household, etc.

According to these data entered by the user, the application will calculate and give recommendations about the optimization of the kitchen.

IKEA Kitchen Planner

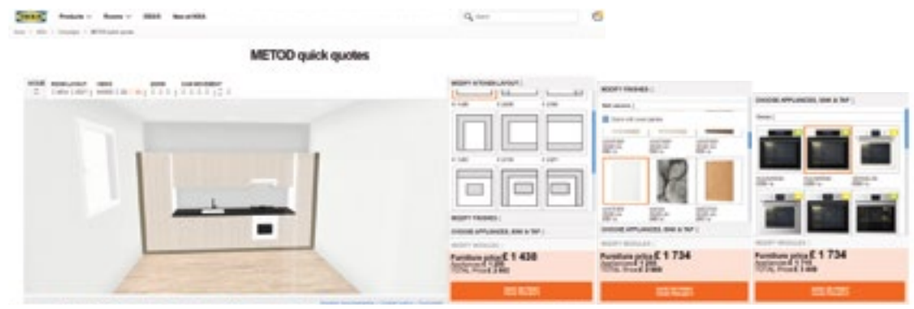
Many online phone and computer applications about house planning and interior design already exist. Although a major part of them, is made with the scope of creating a space as a hobby, with generic furniture, in the level of decoration, it is also possible to find other applications using existing products and color palettes for helping designers and the homeowners in general. One of the best examples of these applications is the IKEA Kitchen Planner which is an online program open to everyone's use for free and help the customer to realize his/her kitchen with the already prepared IKEA modules. The program starts with a square as the purest form of the room and the user can change the measurements of the walls, add windows and doors, customize the physical shell, however, s/he likes. Secondly, the user can realize her dream kitchen by choosing from the variety of IKEA modules, simply by placing them on screen. Finally, by choosing the finishing materials like the decoration of the cupboards and so on the design is finalized.

The most significant benefit of the planner is that it gives the opportunity to the customer to design her kitchen easily and by themselves, and also get a quote for the total pieces of furniture. On the next page, there are the screenshots for explaining the planner better.

SCREENSHOTS FROM THE EXISTING IKEA KITCHEN PLANNER

1 THE EXISTING STRUCTURE

First two screens the user selects the type of kitchen and enters the dimensions with piping details and openings like doors and windows.



2 LAYOUT & FINISHINGS

After creating the shell of the space, the planner creates the beginning kitchen to the user, which later on the use can change, the layout (L Kitchen, U kitchen, galley, island), the finishings like the material and color for the cupboards and the counter top and finally the appliences like oven and so on. According to the change, the price can go down and up which is clearly visible in the total price area highlighted with red.

3 FINAL OVERVIEW

After the planning is done, the user can see the general views in perpective, plan or elevation and see the total price.

Later s/he can print or save their dream kitchen and go to the closest IKEA shop for acquisition.

7.1 Plug-in

The additional programme to be thought as a plug into the IKEA kitchen planner will provide the integration of the containers with kitchen. The program can be used online or by the employees of the kitchen department in IKEA shop itself.

The process is divided into two aspects;

1. SPACE

After the plan has been drawn in IKEA Planner, in the first phase, the spatial aspects will be covered, the user is asked to enter the location of the kitchen and adjust the compass to specify the direction of the kitchen. After this section, the output will be the sunlight calculations and zoning of the kitchen to understand which zone is better for placement.

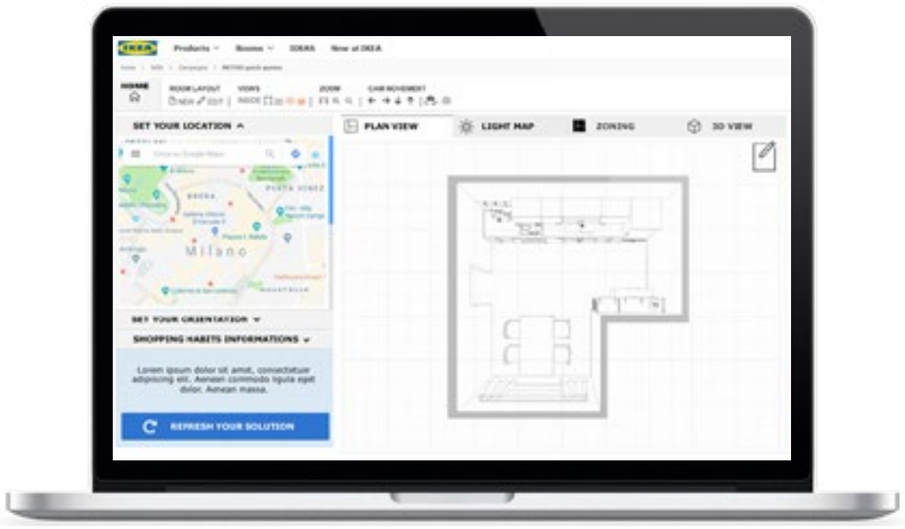
2. USER HABITS

The second section is essential for understanding which container to place and how many are necessary for the needs of the user. By asking questions to the user, about their produce preference, their shopping frequency, how many meals they cook at home, etc.
According to the results, the amounts will be decided.

According to the data of the first part, the result can be chosen in two ways,

1. Without changing the layout placing only the containers in the zones, depicted by the sunlight analysis which will not include a new design of the kitchen.

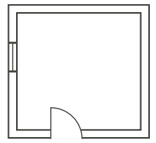
2. By changing the layout or the place of the appliances to achieve the best conditions for the user and also for the containers itself.



Layout

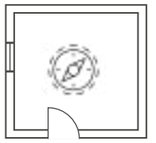
Space

Draw the kitchen

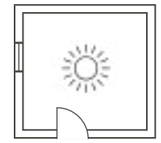


What's the location?

What's the orientation? Turn the compass.



The lighting scheme



• By knowing the location and the orientation of the kitchen, the application can calculate the sunlight and heat to zone the space in optimal, okay and adverse.

User Habits

How many people lives in your household?

How many times a week do you go for grocery shopping?

How much do you waste from 1-10?

How much do you spend for grocery shopping weekly?

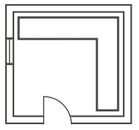
• This section is for understanding the consumer habits, according to these details, the system can calculate, how much storage space they need and which items are favorible for keeping the food within the spatial considerations.

Outcome

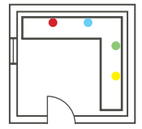
TWO POSSIBLE ROUTES FOR THE END PRODUCT

1. If they want to use the existing kitchen

Draw the existing kitchen through IKEA Application



The system will mark the possibilities to place the produce.

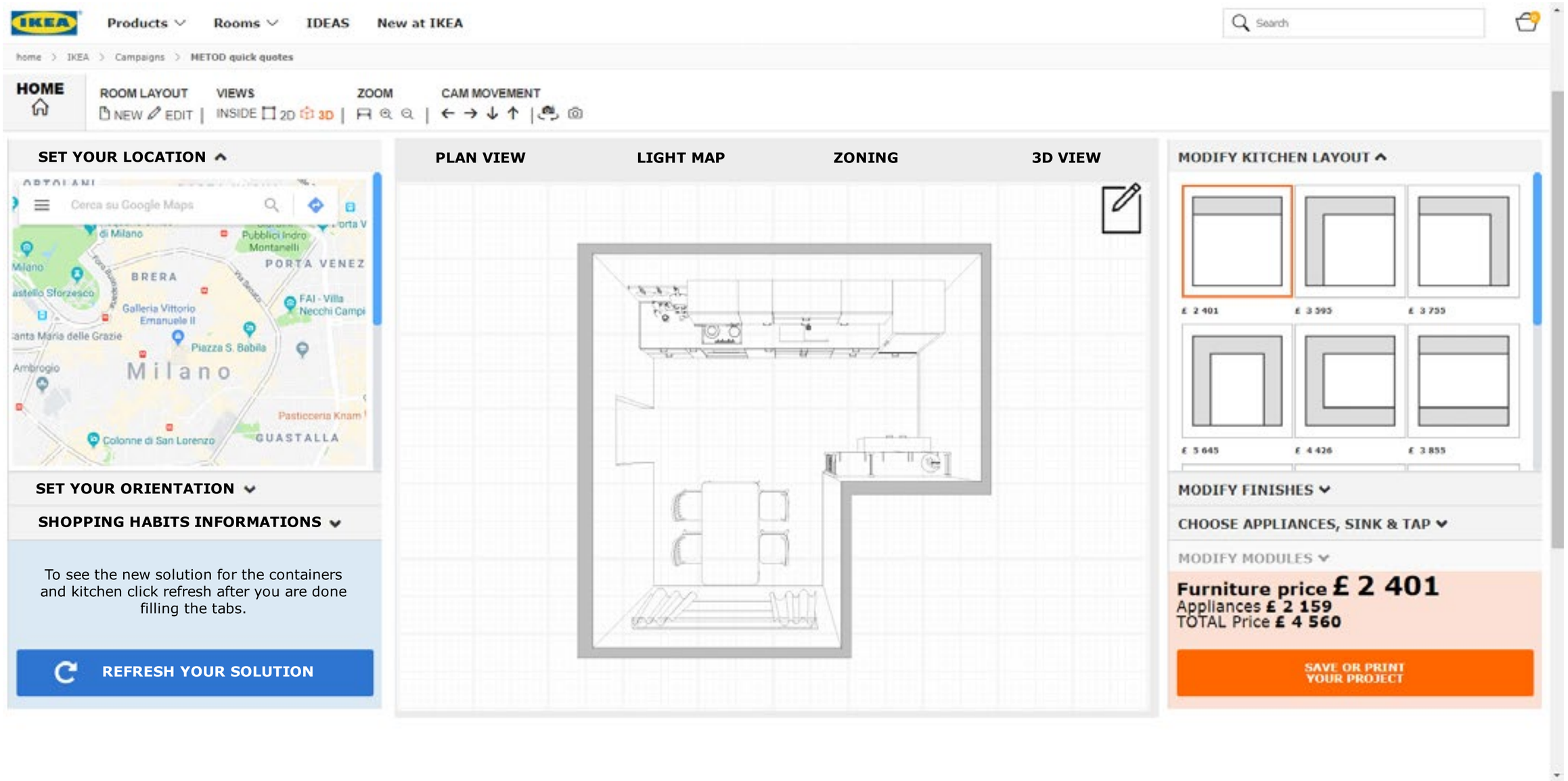


2. If they want to redesign the kitchen

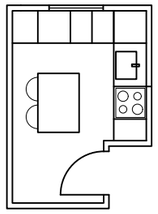
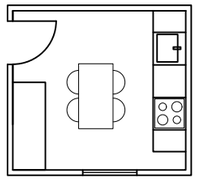
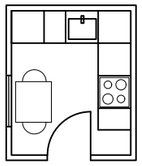
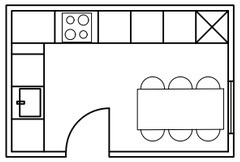
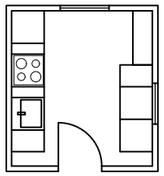
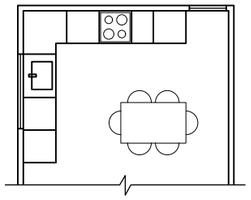
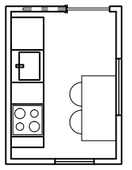
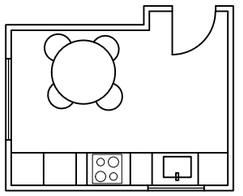
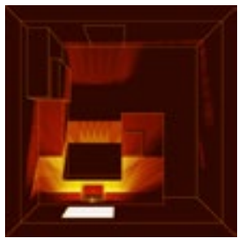
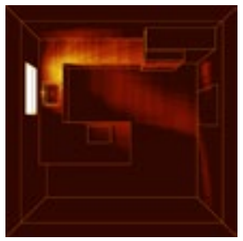
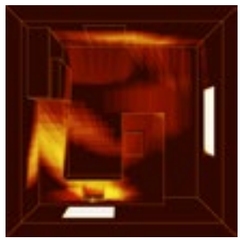
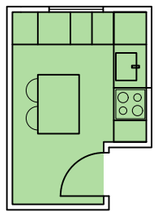
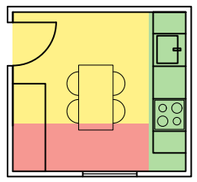
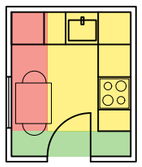
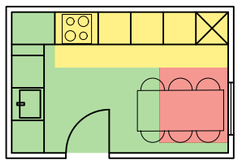
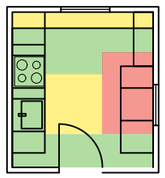
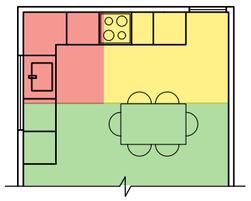
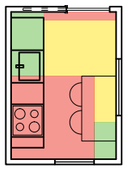
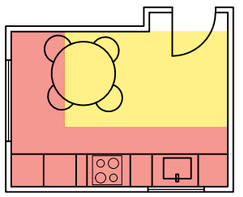
Develop the kitchen layout for the most optimal placement.

The user can select the kitchen finishings from the IKEA application and get a quote.

Mock-up of the Plug-in



Spatial Examples for Orientation

	A	B	C	D	E	F	G	H
PLAN								
	North	South	West	East	North-East	North-West	South-East	South-West
SUN IN THE SAMPLE KITCHEN								
POSSIBILITIES								
COMMENTS	The north exposition does not get the sun directly so the whole kitchen is available for storage.	With the south exposion, the possible places are being yellow and green, best possible spots are the corner of green.	With west exposure, the most suitable area marked with green is small, so in the yellow area can be a better idea to change the place of sink and cooker to create more cooler space.	East exposure, easier to handle, since the sun will arrive in the morning and the heavier afternoon sun won't be present in the room, the green areas are large and with the placement of sink quite useful.	North-East is one of the most suitable options also because the dominant wind of Milano is from the Nord so it will create a ventilated environment, accept around the window, the whole kitchen is suitable, a small change can be repositioning the cooker to the yellow area.	North-East is one of the most suitable options also because the dominant wind of Milano is from the Nord so it will create a ventilated environment, accept around the window, the whole kitchen is suitable, a small change can be repositioning the cooker to the yellow area.	South- East is sunny and warmer than other options, green areas are the best options for the containers	South-West is the most sunny and warm esposition, in every season it will take the maximum sunlight so the most possible areas are marked in yellow, close to the door and table.

LEGEND

UNFAVORABLE

OKAY

OPTIMAL

CASE 1 : Re-Arranging of an Existing IKEA Kitchen

The kitchen's measurements are based on a real example in IKEA Corsico, the module dimensions of the kitchen correspond to the average size of single-wall kitchens in the whole store, on the right, there is the photo of the kitchen that the design is based.

Location : Milano

Esposition: East

User Persona

Related Questions	Answers
Number of people in the household	👤👤
How many grocery shopping made in a week	1-2
Weekly budget for grocery shopping	100-120 €
Food waste from 0-10	3
Comments for the first part	• For a family of 2, with one to two times grocery shopping • There is not so many waste probably because they have a planned cook and buy accordingly.

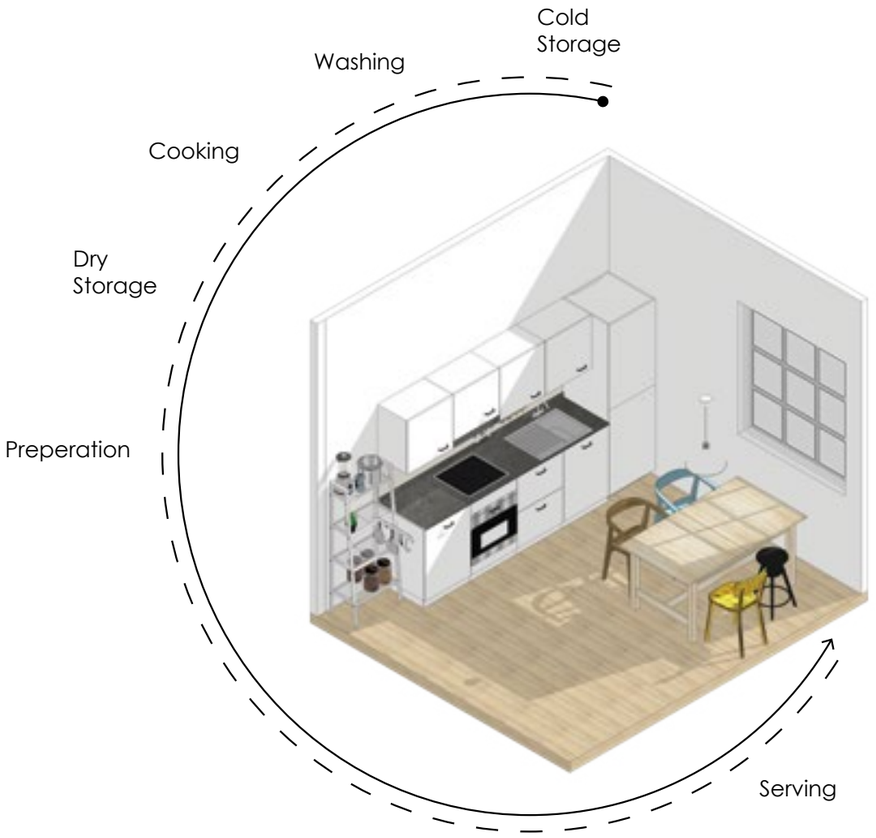
Plan View

Perspective

The Existing Flow of Work

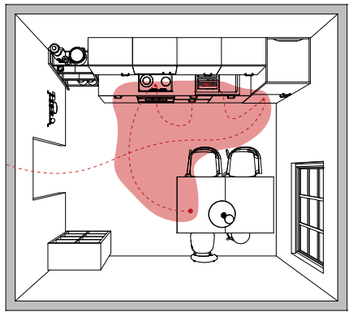
The workflow is from storage, washing, cooking dry storage and serving. The part on the right, helps to understand which part of the kitchen is denser regarding usage, which parts are relatively unused so that the space can be balanced better.

Although the flow is very efficient, could be better if the modules were mirrored so the fridge would be closer to the entrance and sink than the cooker. After the analysis of light on the next pages, it will be better understood how the structure of the kitchen should be.



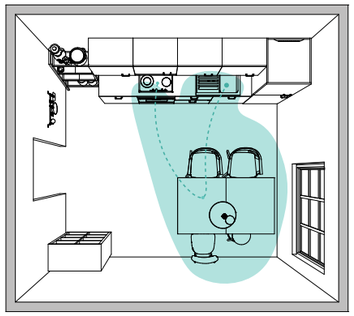
Activity 1

Food Preperation



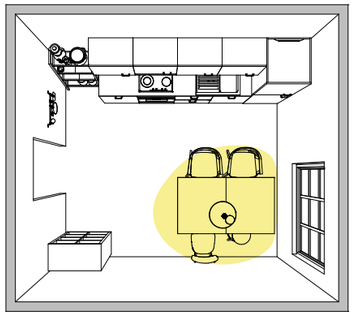
Activity 1

Food Preperation



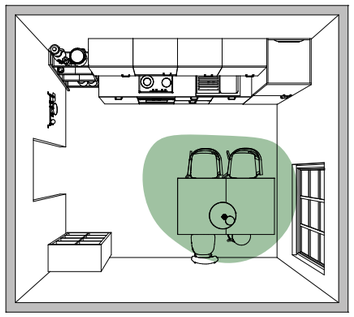
Activity 1

Food Preperation



Activity 1

Food Preperation



Sunlight Analysis

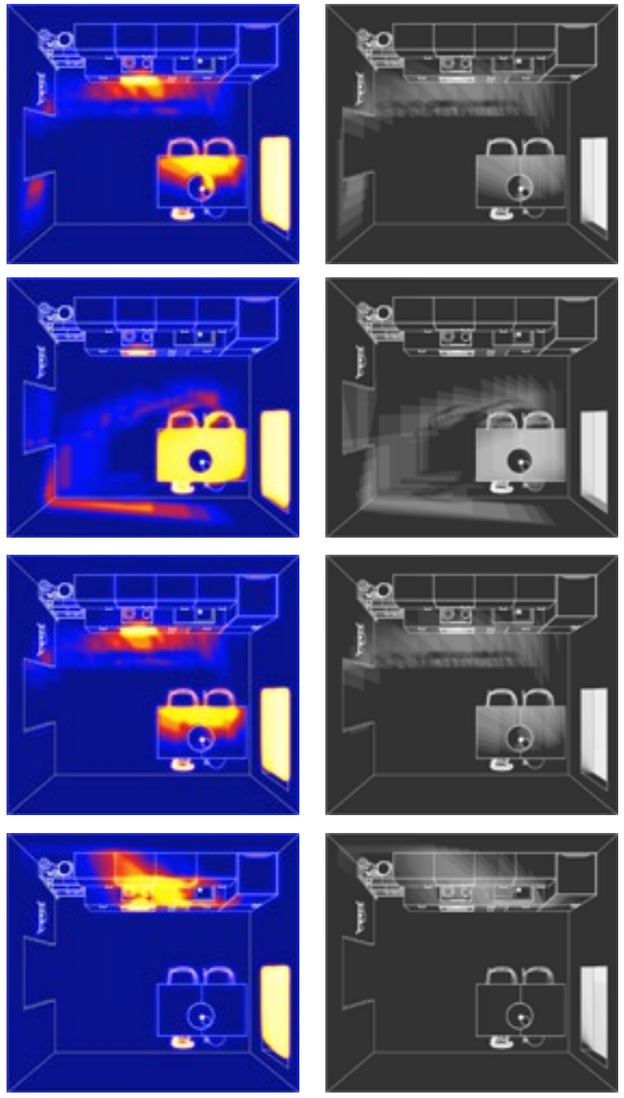
*The east oriented kitchen, only takes the morning light, so all the light movements generated has been captured in between 6 am to 12 am.

21 MARCH

21 JUNE

21 OCTOBER

21 DECEMBER



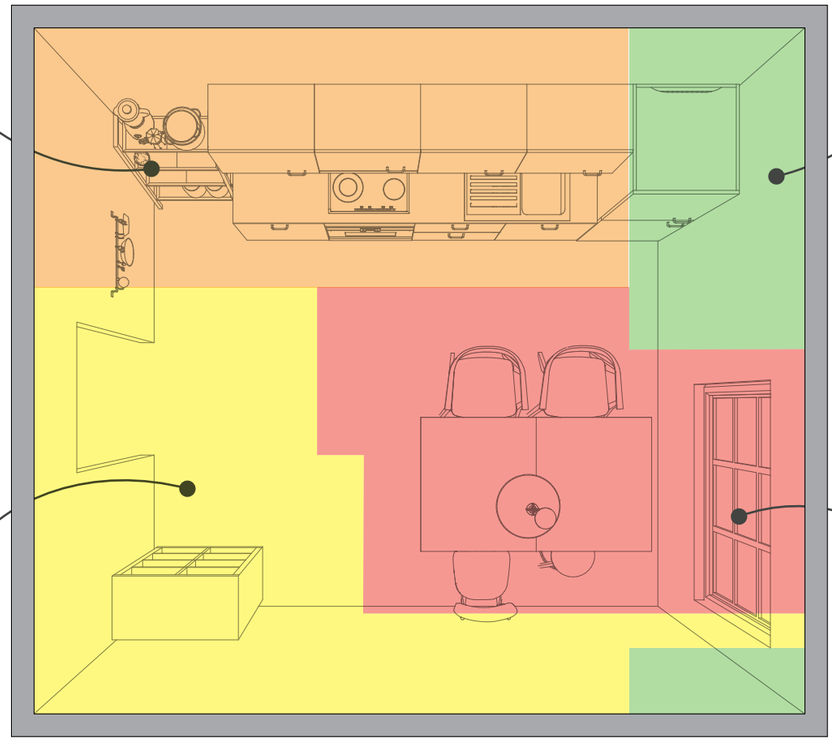
Outcome of Sunlight Analysis

LESS OKAY

The area which the kitchen is situated takes direct sun except for the summer months. Considering the sun arrives only in the morning since the opening is directed towards the east, it is possible to place the produce in this zone.

OPTIMAL

The only two optimal spots are on the corners of the walls with the window. The corner could be taken advantage of better if the fridge would downsize or changes its place with the shelving system in the corner.



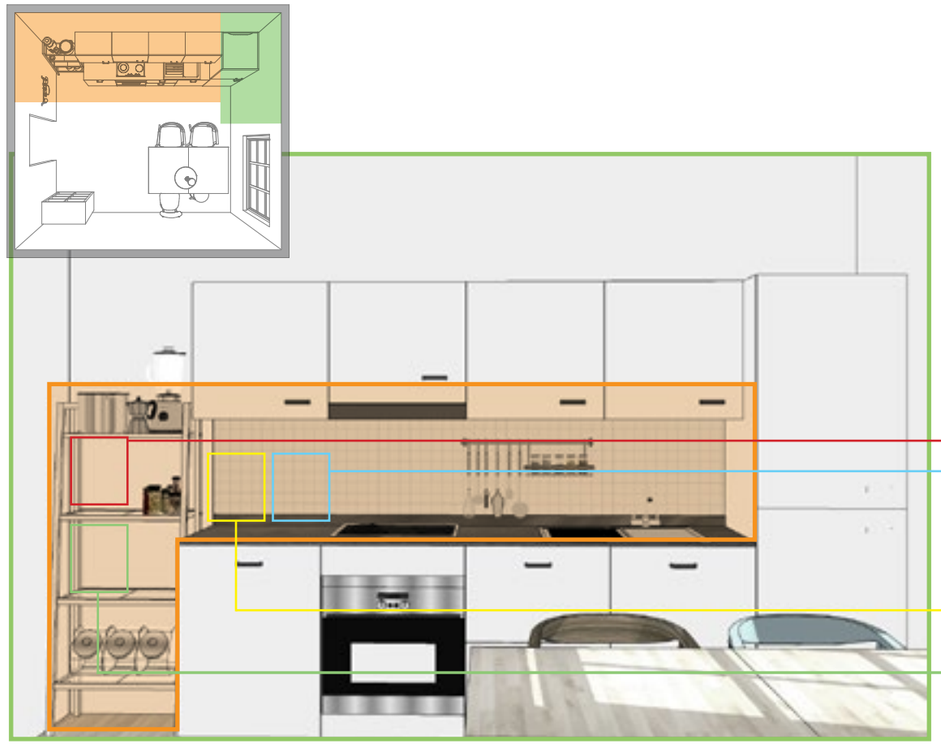
OKAY

This side of the kitchen takes minimum sunlight but mostly in summer months which is a disadvantage. Might be more suitable for placing the modules but does not worth to change all the piping system to make a small difference, this area can be taken advantage of by shelving systems.

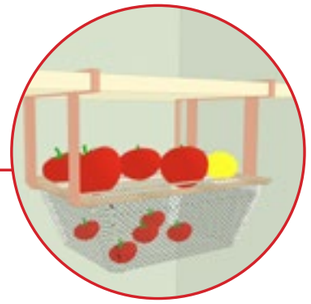
UNFAVORIBLE

The most unfavorable part is the area in front of the window, the most suitable furniture for this area is the table with a beautiful view.

Solutions for development of Space 1: Adding the containers in the best way while keeping the same layout.



The first solution as taken the existing kitchen, all the zone to place the containers are in orange, so in between okay and unfavorable. Moreover, the space is quite limited, so the possibilities are next to the cooker or on the shelving system. The green part cannot be used since it is covered by the fridge.



Red Seat Container

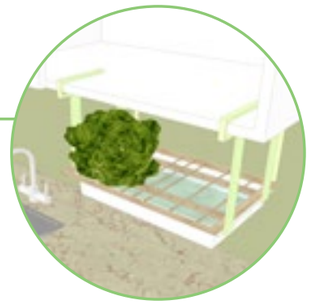
•This container is placed on the shelving unit because that area takes less sunlight and airier
•It is situated as high as possible to have the highest percentage of air circulation which is what tomatoes need.

The Cold and Sandy Container

• This is the container most resistant to heat. It turns heat to an advantage, so it is the chosen one to be placed next to the cooker.
• The disadvantage is they have to be together with the apples because it is not possible to put the containers on the shelves.

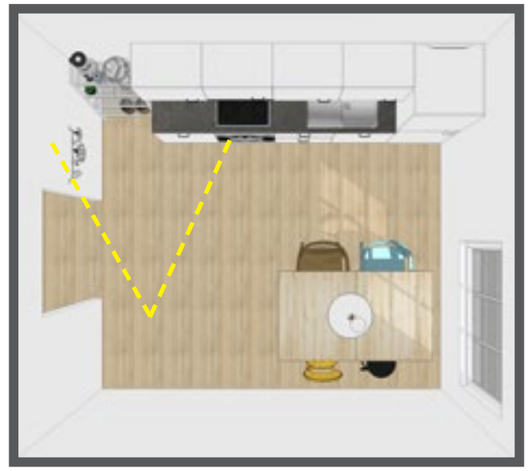
The Frienship Container

The apples and potatoes are placed at the end of the counter almost near the tomatoes. So they won't affect the green leaves with the ethylene emission.



Flying Pool Container

• The green leaves container named flying pool is placed under the tomatoes since there is no possible space in the cupboards.
• It stays on the shadowier part by placing to one of the lower shelves.
• The fact that it is situated under the tomatoes help decrease the ethylene gas arriving at the green leaves since the gas will move upwards.



With the restrictions of space and area, the best possible solution is the corner space left on the counter and the additional shelving system.

In this case, seperating ethylene motives and sensitives is not possible, but in a way by putting the ethylene emitted together and higher, the green leaves will get less damage since the gas will go up. The cold and sandy container is already partially closed so the produce will also be protected.

Solutions for development of Space no.2 :

Changing the layout;

The green marked area is the safest zone of the kitchen, always stays in shade so that area needs to be taken advantage of better.

Another point is the downsizing of the fridge. For two people with all the fruits being outside, a fridge this big is not necessary, the user can choose a smaller option to put under the counter or place on the eye level to make it more comfortable.

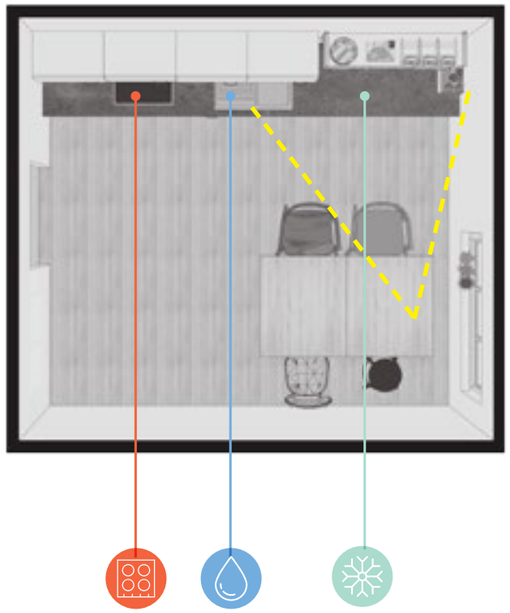
The possibilities,

2.a The prosposal for using also the green area is adding two more modules there with a corner module and create an L kitchen. By this way, the downsized fridge can go below the counter, with a shelf to hang the green leaves and the tomotoes, and the counter to place the containers directly will be the solution.

2.b Instead of adding the new modules, just adding the bookcase like the kallax that the existing kitchen already has on the scheme with a little repositioning and a shelf to hang the two containers.

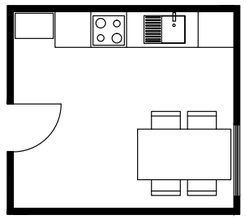
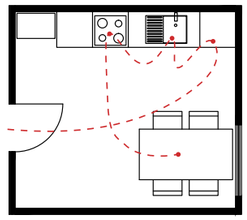
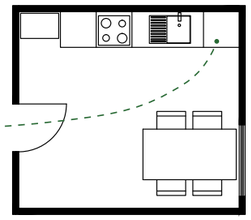
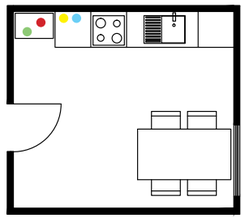
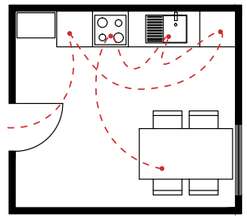
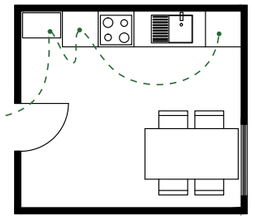
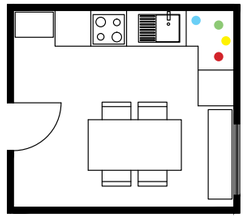
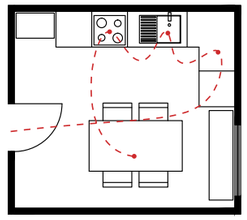
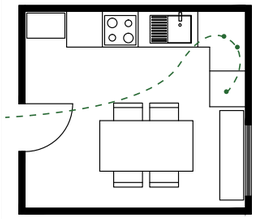
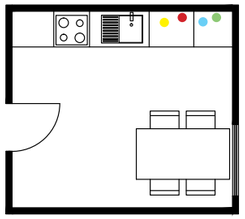
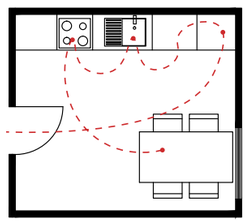
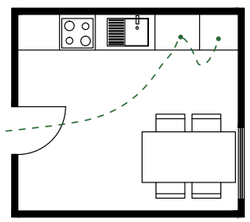
1.a

Changing the layout to L Kitchen to make the maximum use of the shadowed zone.



1.b

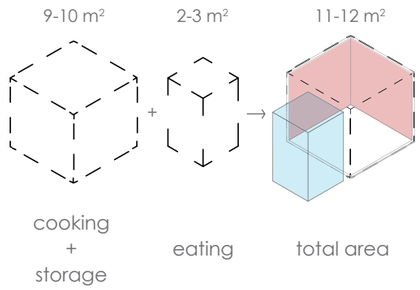
Keeping the one wall kitchen but making the fridge smaller to open up more counter and wall space for the containers.

TABLE OF COMPARISON	PLAN	MODULES	CONTAINER POSITIONS	WORK FLOW	FLOW EFFICIENCY	GROCERY FLOW	VEGETABLE HAPPINESS
INITIAL PLAN		60 cm 60 cm 60 cm 120 cm 60 cm			●●●○		●○○○
ROUTE 1 PLACING DIRECTLY THE CONTAINERS		60 cm 60 cm 60 cm 120 cm 60 cm			●●○○		●●●○
ROUTE 2.A CHANGING THE LAYOUT		60 cm 60 cm 60 cm 120 cm 90 cm			●●●○		●●●●
ROUTE 2.B KEEPING THE LAYOUT , CHANGING THE PLACEMENT		60 cm 60 cm 60 cm 260 cm 140 cm			●●●○		●●●●

LEGEND: fridge · sink · cooker · counter + cabinets · seperate storage

CASE 2: Re-Arranging of an Existing Kitchen

This kitchen, has been created according to the data obtained from the IKEA Corsico model kitchen examples. After the esposition of work flows, the most efficient kitchen in terms of work flow balance diffusion is the 'L type kitchen'. The average m2 for the L shaped kithchen typology is 9-10 m2 with the addition of a eating area which is around 2-3 m2.



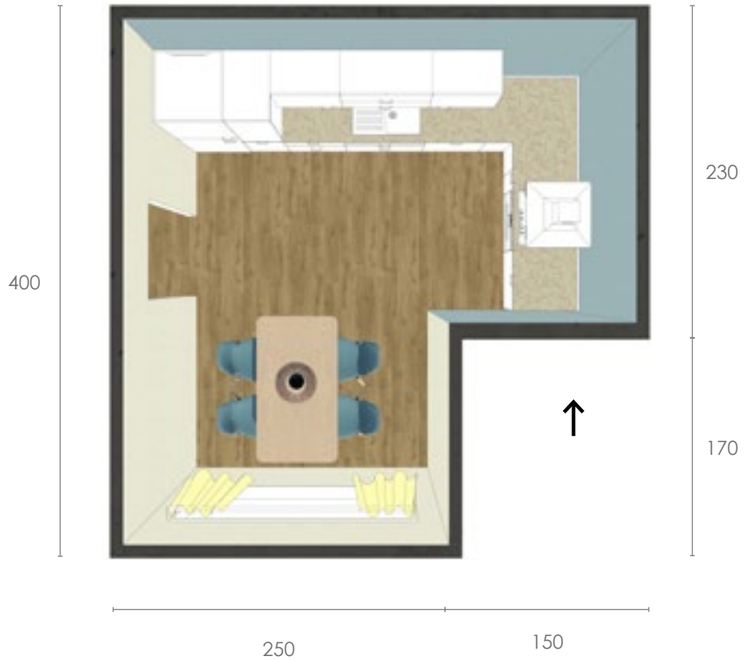
Location : Milano

Esposition: South

User Persona

Related Questions	Answers
Number of people in the household	4
How many grocery shopping made in a week	2
Weekly budget for grocery shopping	80-100 €
Food waste from 0-10	2
Comments for the first part	• For a family of 4, with two times grocery shopping • There is not so many waste probably because they have a planned cook and buy accordingly.

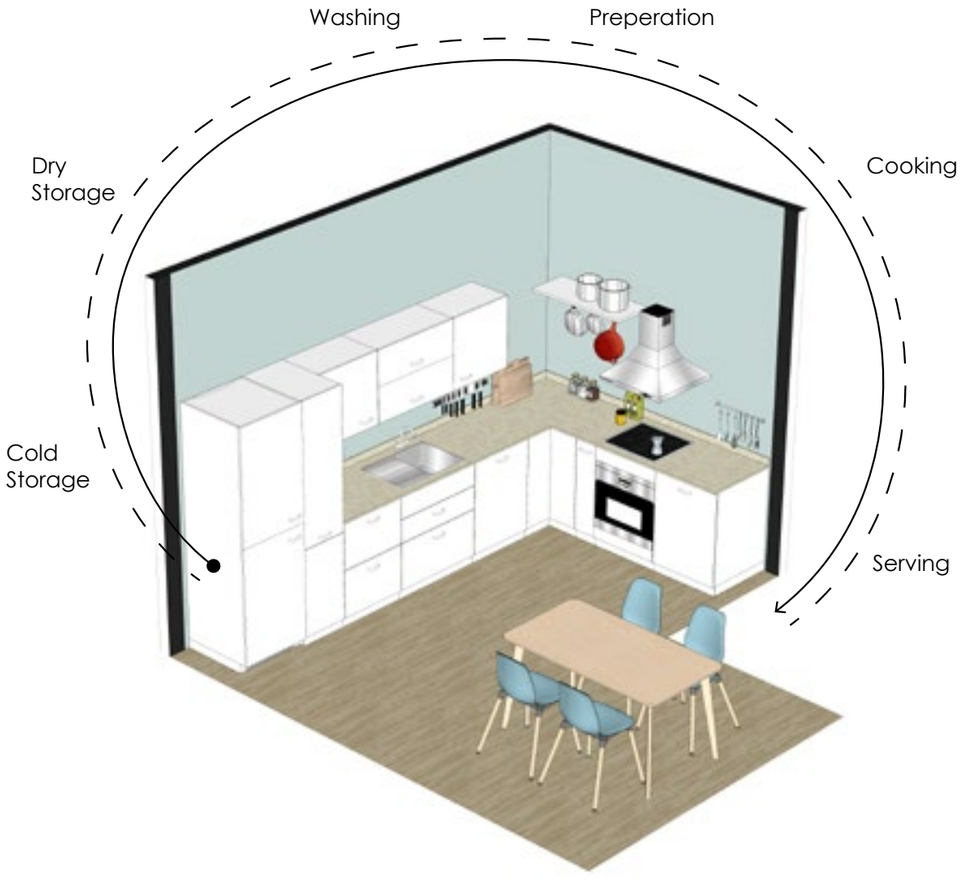
Plan View



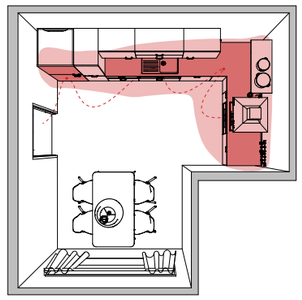
Perspectives

The Existing Flow of Work

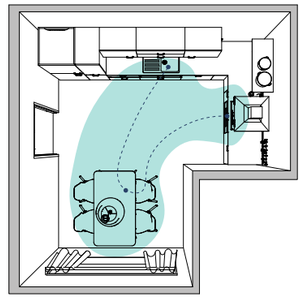
The work flow is from storage,washing, cooking and serving. The visualization of the activities, on the right, helps to understand which part of the kitchen is more dense in terms of usage, which parts are fairly unused, so that the space can be balanced better.
On the next page there is the flow of movements after shopping, all the materials go to the fridge, because there is no other space usable but with the possible solutions proposed by ikea, using of walls, the counter and seperate shelving systems will provide the space needed for storing produce in the correct way.



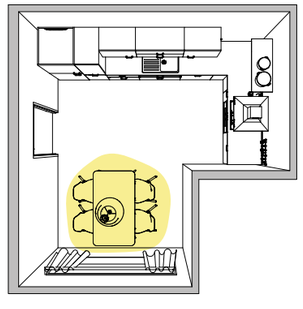
Activity 1- Food Preperation

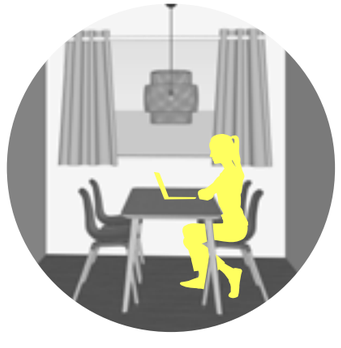


Activity 2 - Eating



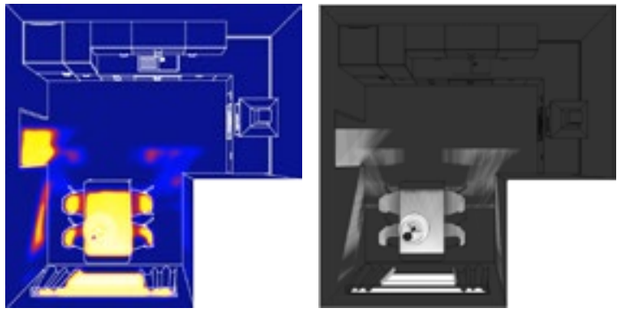
Activity 3 - Working/Studying



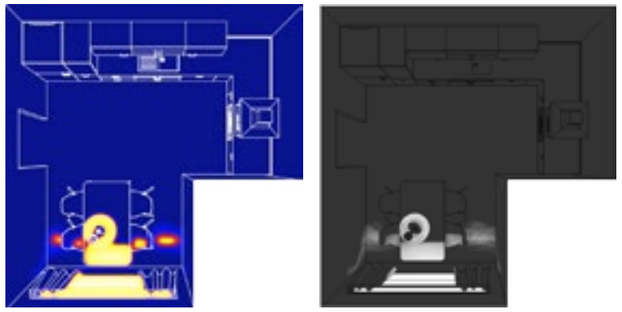


Sunlight Analysis

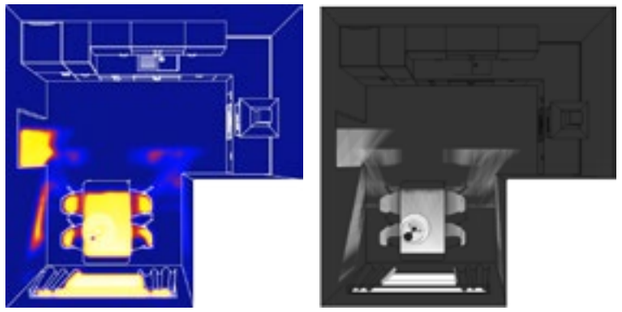
21 MARCH



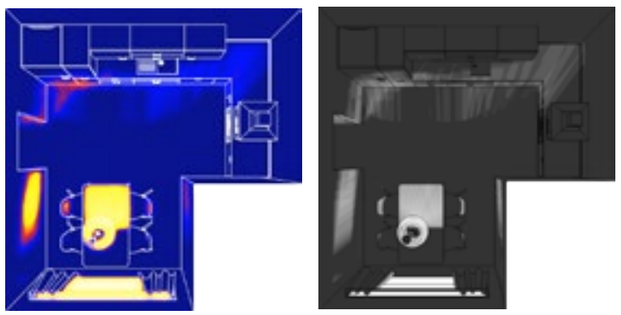
21 JUNE



21 OCTOBER



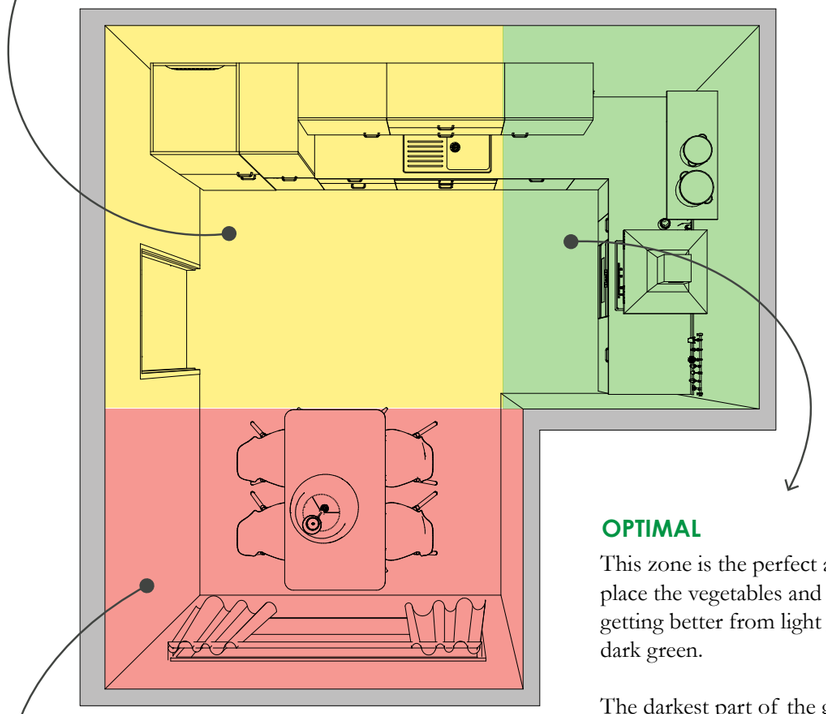
21 DECEMBER



Outcome of Sunlight Analysis

OKAY

Other than winter, it doesn't take much direct sunlight and the sink provides humidity so this area might be possible especially for the produce that stays inside the terra cotta pots, which will increase the evaporation thus cooling the interior of the pot.



UNFAVORIBLE

The red zone takes direct sunlight which is not suggested for the produce conservation.

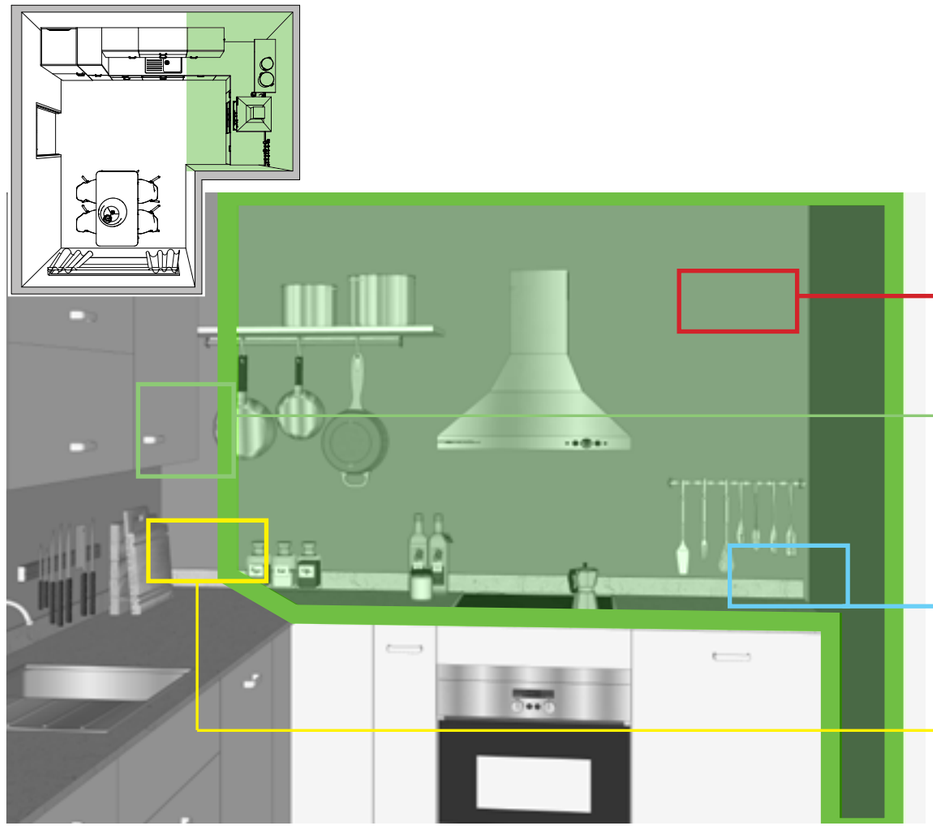
OPTIMAL

This zone is the perfect area to place the vegetables and fruits, getting better from light green to dark green.

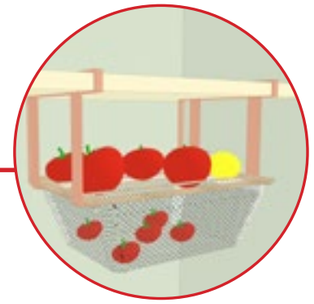
The darkest part of the green stays always in the shade and it is the exterior wall so even if the interior is heated, the wall will stay in a colder temperature thus will provide the needed conditions for the produce that needs cool conditions.

As a negative point, the cooker and the oven is placed in this direction so the activity of cooking will increase the temperatures .

Solutions for development of Space 1: Adding the containers in the best way while keeping the same layout.

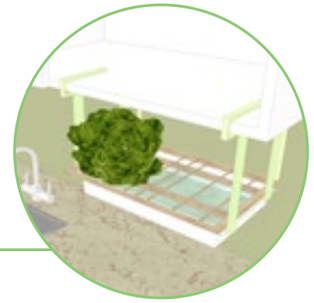


Using the green marked area for placing the four designed containers for fruits and vegetables since that side remains always in shade. But at the same time from the cooker will generate heat so the containers should not be placed closely.



Tomato and Lemon

This container is placed on the corner with an additional shelf because;
• It is closer to the outer wall, depending on the insulation it may provide more coolness.
• It is fairly away and at least on top where there is more air circulation which is what tomotoes need.



Green-Leaves

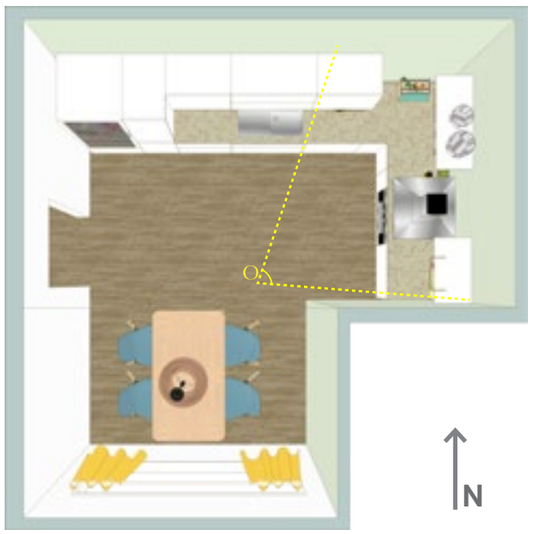
The green leaves continer named flying pool, is placed close to the sink, because;
• They should be away from the tomatoes and other ethylen emitting produce, to decree the effects.
• Since the important point about green leaves is their hydration, even if it takes fair sunlight it won't get effected thanks to the water source.

The Cold and Sandy Container

The storage for carrots, green onions and inside, eggplant, zucchini, in winter orange and mandarin is placed on the corner right at the bottom of the Flying Pool because;
The corner is the only part inside the green marked area that takes direct sunlight, but as a closed container made from terracotta, the heat is an advantage since it gets cooled by evaporation of the water sprinkled on the terracotta surface or actually watering the sand.

Apple, Pear and Potato

The apple, pear and potatoe container, is situated at the corner close to the outer wall and close to the tomatoes since they are both ethylen emissie. The reasons are;
Because it is made from wood, under sun it won't provide enough ventilation and coolness to the potatoes, and although apples are very durable, or course they stand better in shade.



Other than the sun calculations which depicts the green corner, it has been taken in to consideration,

• Seperating **the ethylen sensitives (on the left)** and **ethylen producers (on the right)** to decrease the effects.

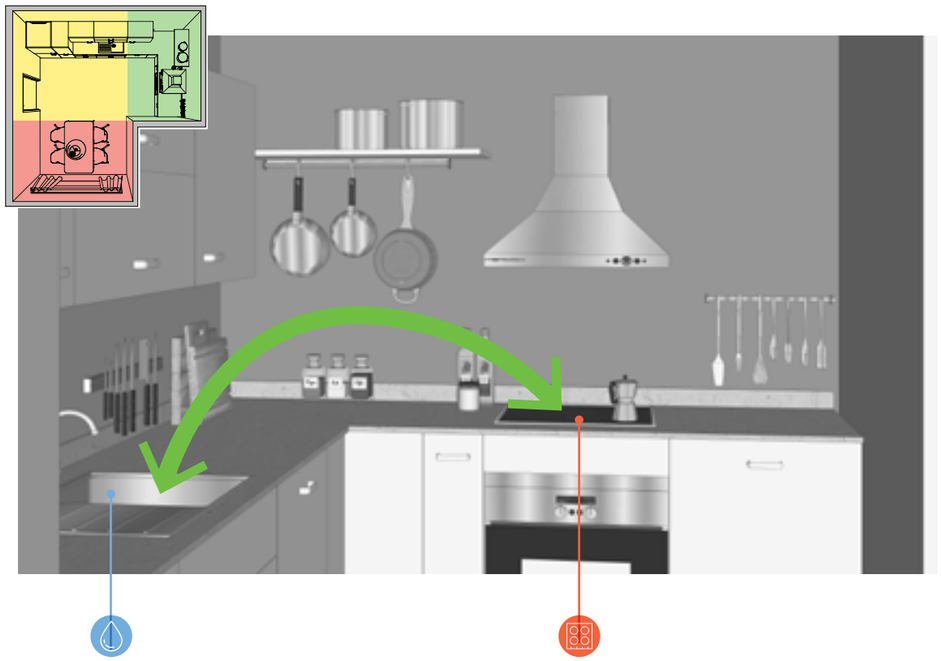
• **The green leave**s should stay closer to the **more humid area** and on the corner which takes sun,

• There is the **closed terra cotta container** which will turn **the sun to an advantage** with evaporation from the regular watered surface or the sand of the carrots, in this case.

Solutions for development of Space no.2 :

Changing the layout;

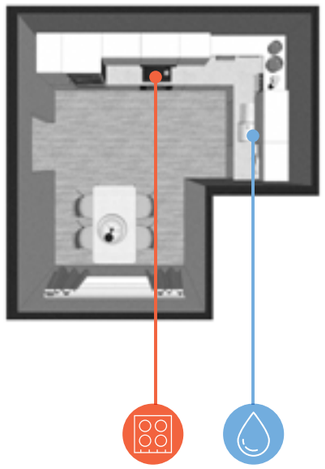
2.a By changing only the placement of utilities

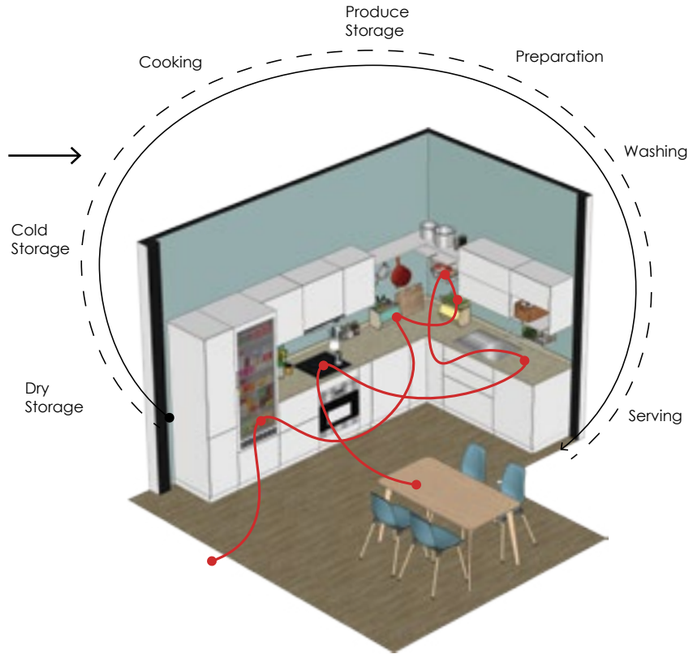


Again in the green marked area, the first change to be done to make a great effect can be changing the positions of the oven and the sink. Thus the sink would be hydrating the shaded area so it woud become more favorible for the produce that stays in the open. Meanwhile the cooker being the heat source will be placed away.

After the utilities are switched the container can be put in the same way as in Solutions for development no.1.

Process





CHANGED PLAN & CHANGED FLOW

By changing the place of the cooker and sink like in the plan above, will give the suitable solution for creating a humid ambience instead of the increase in heat with cooker.

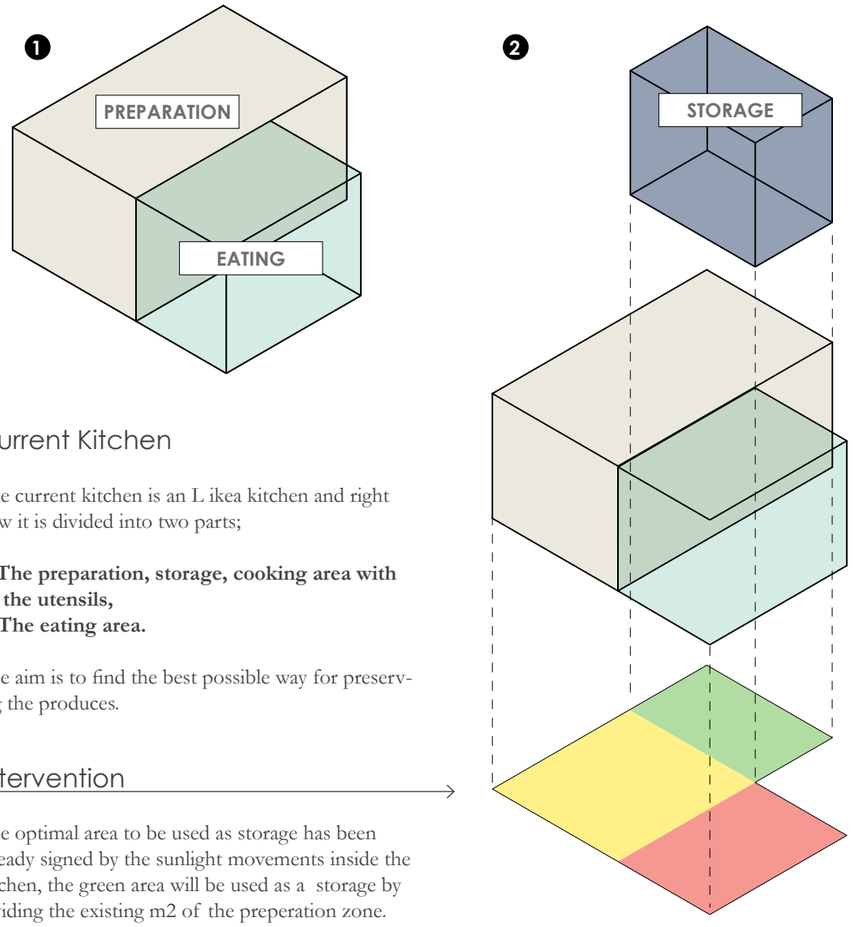
On the graphic at the right, there is the perspective view of the kitchen with the utelsils switched for the best, and the flow diagram of their activities. It is easily visible that in this case the flow is interrupted, the user does not have the storage-sink-oven triangle which is not prefered. It is more complicated and uncomfortable.

Although the main aim of this thesis is decreasing fruits and vegetable waste, human comfort is also another important aspect which should not be forgotton, the minor switching of utensils will help the produce but in terms of user experience should be rethought and developed in a more comprehensive way which would feature alternating the layout of the kitchen.

Solutions for development of Space no.2 :

Changing the layout;

2.b Alternating the layout- Adding or extracting the modules



Current Kitchen

The current kitchen is an L ikea kitchen and right now it is divided into two parts;

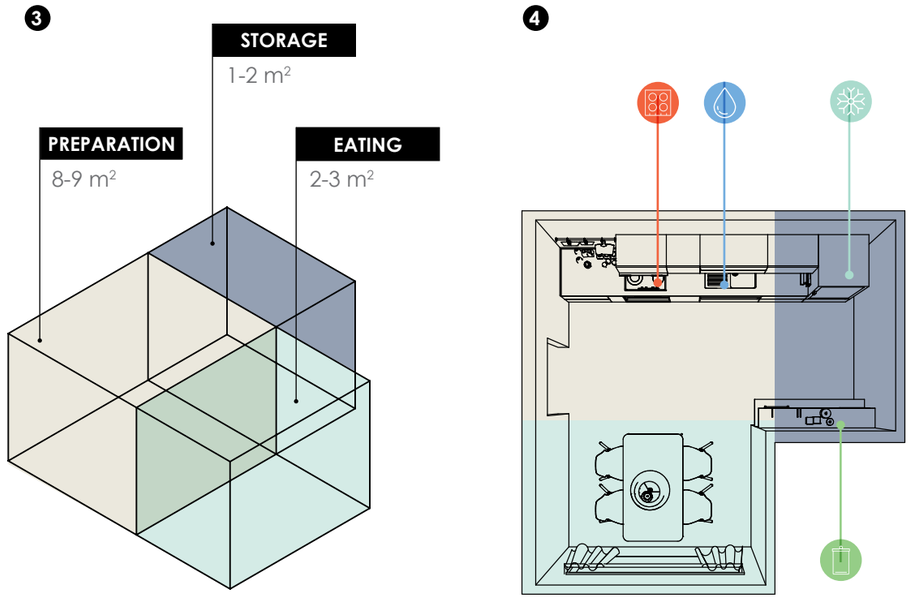
1. The preparation, storage, cooking area with all the utensils,
2. The eating area.

The aim is to find the best possible way for preserving the produces.

Intervention

The optimal area to be used as storage has been already signed by the sunlight movements inside the kitchen, the green area will be used as a storage by dividing the existing m2 of the preperation zone.

This will create a concentrated storage area to put both the fridge and the containers.



VOLUMES

With the volumes re-distributed, in the storage zone, there will be;

- The fridge,
- Dry storage
- The containers.

So the area becomes a open cellar, most importantly seperated for food. This gives the possibility to keep every produce close to each other while providing the optimal conditions they are easier to reach and see.

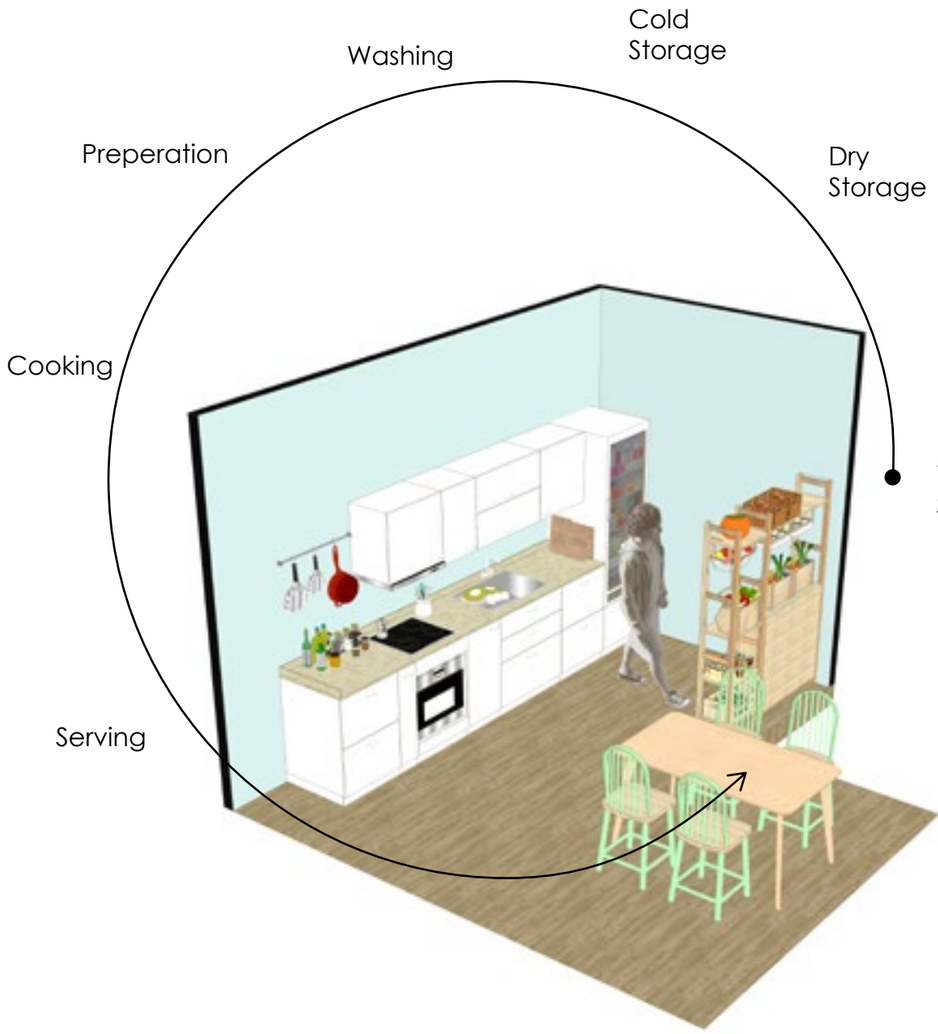
To fix the confusion of work flow, after the shifting of fridge, the lining would be; cooker, sink and fridge.

THE NEW PLAN

The final plan divided in three zones, the previous **'L type'** of layout replaced by a **'Single wall kitchen'.** In the storage space there is a shelving system to hold the containers and other possible items. At the bottom there is the list of utilities and their size which are not less than the initial plan.

100 cm
60 cm
120 cm
60 cm
480 cm

New Work Flow



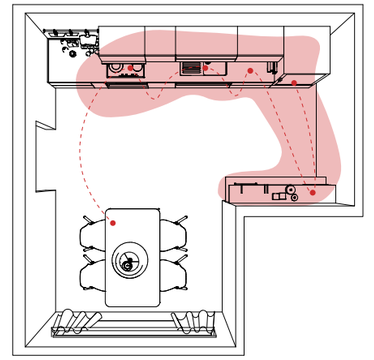
ACTIVITY 1. PREPARATION

The flow starts from the storage zone and goes by sink, cooker and table.

BENEFITS:

• Putting the vegetables and fruits on a zone all together but in a visible way will decrease the waste. Now they are more reachable and memorizable.

• Also being able to see what is inside the fridge is a gain both for electricity since there is no need to open and close to see what you have and also as the first reason their visibility has increased.

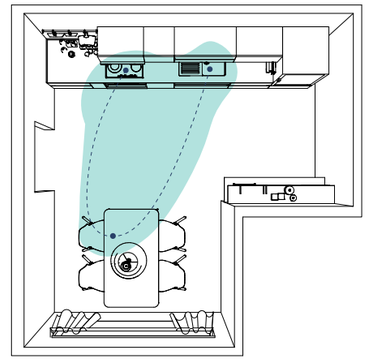


ACTIVITY 1. EATING AND CLEANING-UP

The flow goes from cooker, table and sink, creating another kitchen triangle for prepa-ration, eating and cleaning.

BENEFITS:

• The work flow is faster and more comfort-able.

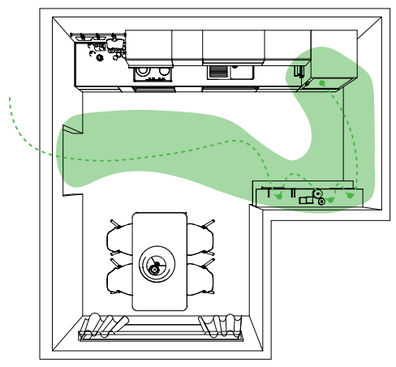


ACTIVITY 3. AFTER GROCERY SHOPPING

The user needs to go to the end of the kitch-en to place the goods, having placed them at the same area, also gives the owner the easeness to change their habits, since the storage area is where s/he will use to open the packets.

BENEFITS:

It is easier to place the items, and prevent the possibility of the containers and shelves get-ting forgotten or used for other items.



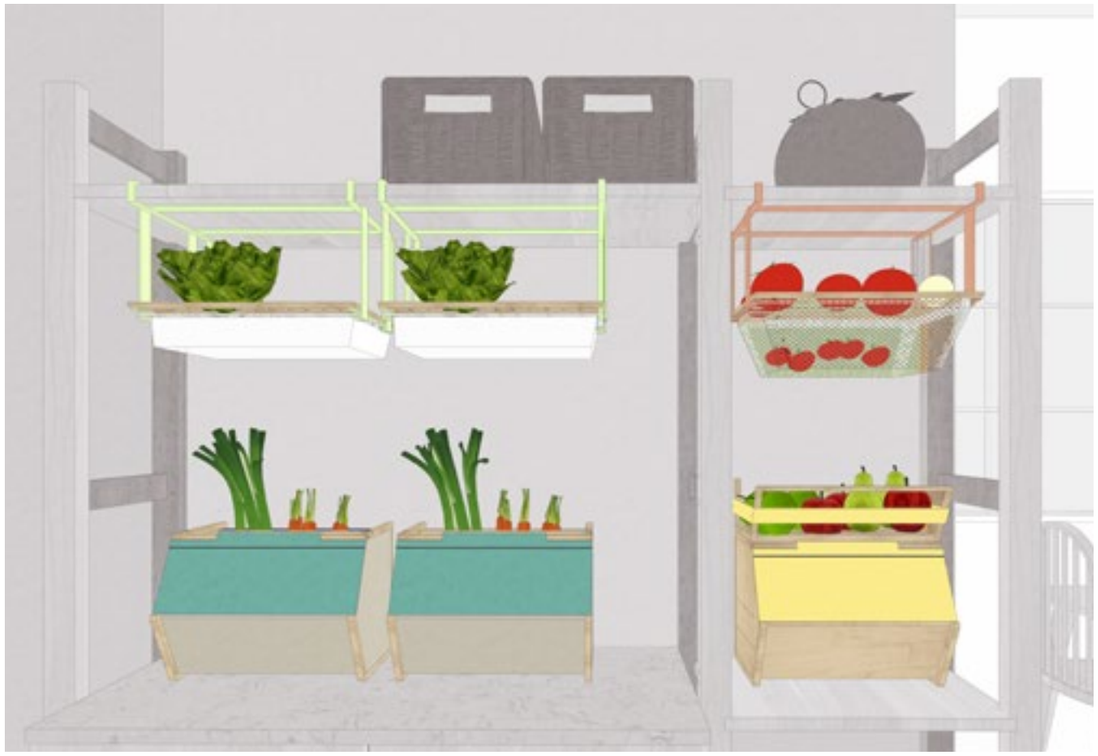
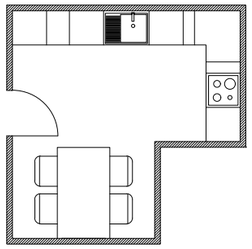
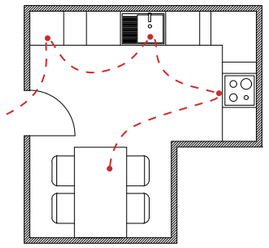
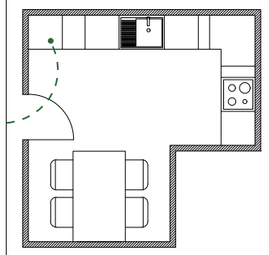
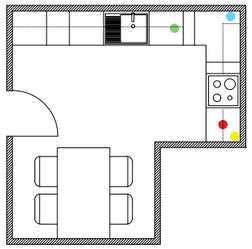
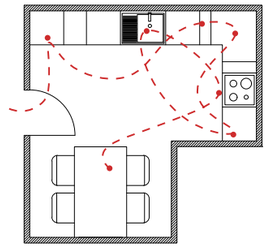
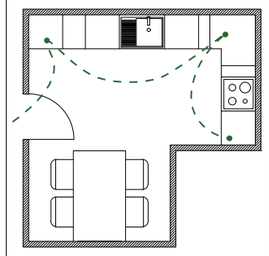
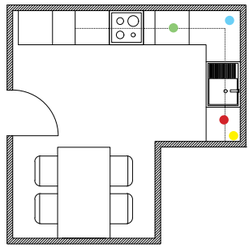
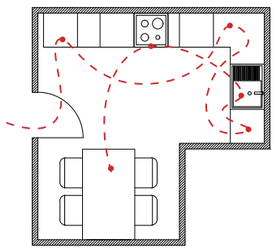
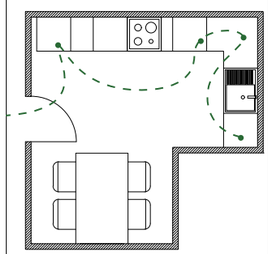
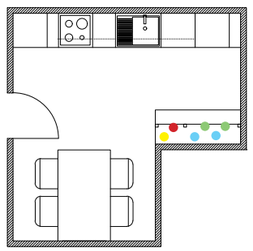
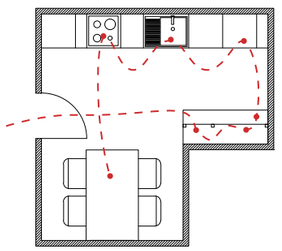
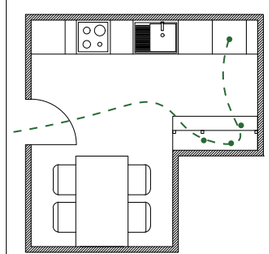


TABLE OF COMPARISON	PLAN	MODULES	CONTAINER POSITIONS	WORK FLOW	FLOW EFFICIENCY	GROCERY FLOW	VEGETABLE HAPPINESS
INITIAL PLAN					●●●○		●○○○
ROUTE 1 PLACING DIRECTLY THE CONTAINERS		60 cm 60 cm 60 cm 300 cm 40 cm			●○○○		●●●○
ROUTE 2.A KEEPING THE LAYOUT & CHANGING THE UTILITIES					●●○○		●●●●
ROUTE 2.B CHANGING THE LAYOUT		60 cm 60 cm 60 cm 260 cm 140 cm			●●●●		●●●●

LEGEND: fridge, sink, cooker, counter + cabinets, seperate storage

8. How to Reach the User - Getting Informed

THE FINAL STEP OF THE PROJECT IS ABOUT THE INFORMATION FLOW. HOW DOES THE USER GET THE INFORMATION AND THE CONTAINERS TO STOP FOOD WASTE?

There are two specific spaces chosen for connecting the consumer end to the correct knowledge.

1) SUPERMARKETS

The supermarkets are the bridge in between the produce and the house, The connector from the farm to table. The main connector, also as markets are also have a part in the food life cycle.

The supermarket's primary aim is to have a profit, so the goal of the project is to convert the shopping experience to a self-learning activity, without interfering too much with space itself, through minimal additions.

The system operates with the help of infographic posters that are leading the way to a model kitchen that shows the ideals of food storage. In this way, the customers can see the examples of containers and how to use them and finally s/he can use the weight machine that prints modified etiquettes instead of traditional ones with additional information about storage

2) THE IKEA SHOPS

Already taken as a reference point for the projects, with the plug-in to the application, IKEA Stores can be another point of information about food waste. Realizing a prototype kitchen in one of their example spaces can make a high impact on hundreds of people going to each store every day.

Moreover, the possibility of making a change is more significant when the user wants to renovate their kitchen, with the example housing they can have a brief visual idea, and than with the help of the plug in the user can design his or her ideal kitchen in a more sustainably conscious way.

8.1 Supermarket Journey

1

Advertisements

There are two types of adverts: the first is the banners placed on the entrance giving general information about food waste.
The second one is an additional fitting on the shopping cart, highlighting the economic losses caused by food waste.
It is a marketing technique to take the initial attention of the customers on the subject of food waste.

2

Sample House

Than the customer arrives to the example house before arriving to the produce section, The kitchen is completed with all the appliences and also designed according to the light and wind data of the existing conditions of Milan as it is studied on the previous chapters.
Most importantly, in this part s/he can find the possible storage examples recreated on display with the containers all coded with a specific color.

3

Containers

Inside the sample kitchen, there are the containers designed according to the specifics for each group of vegetables and fruits.
Another aim of the containers are also to take them from this compartment and use them shopping bags and measuring units throughout the shopping activitiy because they are alldimensioned specifically for the amount of needs. Other than this in this section the customer can;
- have a look at the solutions,
- buy the container system for her/his house
- take one of the fliers or posters with information on storage.

4

Signboards

The signboard which is generally used for writing the name of the product, pricing and origin.
In this case additionally there is also the storage information indicated.
Learning how to store while buying the produce is the best way to fight against food waste, since a great percentage of consumers learn how to preserve their food in the markets and after the elder generations, secondly consumers trust the information they get from the supermarket regarding food storage.

5

The pricetags

On the fifth step, after getting the containers or just seeing them, it is time to correctly tagging the produce.
Every group as it is seen in the containers beforehand, has a particular color to categorize and after the use gets the fruit, the weight machine, gives him/her a tag on the same color of the container, a colorful barcode etiquette, containing: barcode and technical details, the name of the produce and information about storage.
With this way, the customer can take a small manual in the

6

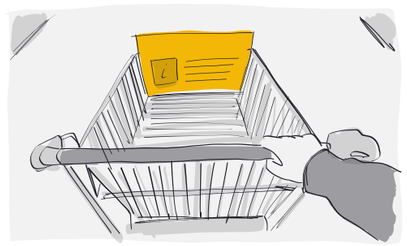
House

After shopping, the customer turns back home with:

- His groceries;
- Colored tags on each sack for later reference;
- Containers made specificaly for each group of fruits.
- Ideas to recreate the containers since they are made from easily reachable materials;
- With knowledge about how much we waste food and what a normal human being can do.

Storyboard of User Journey

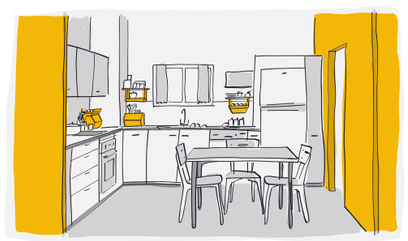
1. Going for grocery shoopping in a supermarket



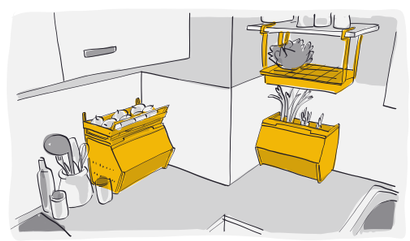
1.Right after the entrance, the customer sees the advertisements adressed to the family budget and economics, added in the shopping cart.

1. Again closer to the entrance, there are the banners and fliers, giving information about the importance of food waste.

2. Continuing the usual path of supermarket, the client come across a prototype kitchen space.

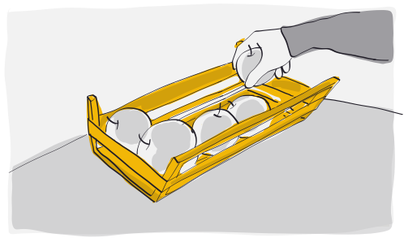


3. The prototype aims to simulate the kitchen space with everything included to demonstrate the possible new solutions for storage.

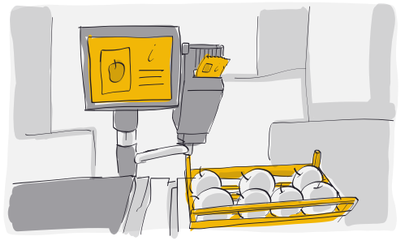


3. The containers are on display in the kitchen with produces, and also available for acquisition also to use for shopping instantly.

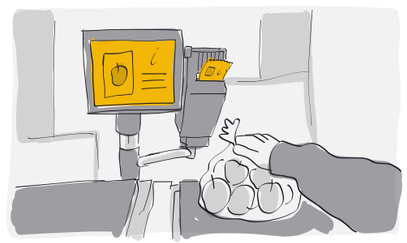
4. After seing the containers, now in the groceries aisle, the client can get information about the background of each produce and how to store them

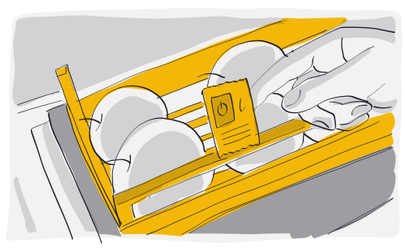


4.1 S/he can use the container to collect the items or other already existing bags.



5a/b. The final part is the weight machine that generally gives, the etiquette for the pricing, in this system the machine gives a colorful etiquette(in the matching color of the producs container), giving information about the time and storage conditions of the produce.





6a/b. The etiquette as a piece to take home, gains an additional value, instead of only giving the price, it is a little kit. It is attchable either to the continers or to the bags.

9. Conclusion

Food waste at Rio Rico Landfill in Santa Cruz County, Arizona.
Photo by Bryan Schutmaat

Food waste is happening in vast amounts and gets overlooked almost by everyone. More than the theoretical study, to understand better the situation, through out the project, the author also volunteered with a group called 'Recup', for collecting the left-overs after the weekly market. It is there, the reality can be seen more accurately, with the merchants throwing away 300-400 kg of fruits and vegetables daily. Having witnessed to these scenes, amplified the effects of literature research, the data stated by food waste activists, dumpster divers and gleaners like Tristram Stuart or Paul Greenfield. **Wasting as a verb is not only 'a thing that gets trashed', it also contains throwing away the time, source and money of the consumer, producer and nature itself. Food waste is one of the worst kinds because the western communities are almost blinded to the facts, mainly because of lacking information and even if they know, it is hard to believe and make an effort in this abundance. The aim of this project was trying to find ways to improve the consumer end of the food system to decrease the waste we are producing.**

As mentioned previously, **food waste is not a conscious act of consumers, it is an adopted habit that we take for granted.** The fundamental problem is the lack of connection in between the farms, producers, and the consumers likewise between the citizens of developed countries and developing countries. **The consumers that have the luck and privilege to pay for wasting food should understand that every act either waste or savings affect the poorer parts of the world.**

To make people aware of this reality, the best place is the 'Supermarket' where one has to spend a handful of time, thanks to the many marketing strategies. Instead of pumping the ideology of selling more, why not turn this time into a more ethical passive education process about the realities of the world and food systems. **Regrettably, the systems and economic balances are harder to adjust when there are interests involved. In the light of this reality, the project's aim is without influencing the profits of the market, trying to enlighten the client with small changes, such as, adding informative price tags or a prototype kitchen to show the storage ways and explaining the problem with easily understandable infographics with banners.**

At the same time, **the amount of waste created in the household, although the largest, is the easiest to resolve since it is the most individual and free act of all the stages.** It is even enough for the consumers to get informed and be careful about what they are buying and how to store.

Against the idea of throwing all the produce in the fridges, the containers designed as a part of the project, aims to bring them on sight as much as possible, for extending their lifespan while reminding the user its existence. But it is also clear that our way and understanding of storing vegetables and fruits is wrong. **With the invention and spread of fridge, the place of produce is inside the fridge.** Except for some obvious cases like onions or garlic, there is no existing design for storing other edibles, in this case with the IKEA plug-in the project aims **to add another aspect to think about while designing the kitchen space, considering the sunlight and users eating habits.** Also as an information area for the users, **IKEA is the second option for putting a prototype after the supermarkets with their potential of educating the customers.**

Additional to household containers, with adjustments like, overcoming our aesthetic prejudices, thinking twice before jumping into a campaign made by a supermarket, shop according to the daily needs, it is possible to make a significant decrease in food waste. **This change in the smallest elements in the daily life can make a huge impact on the agriculture and processing stages.**

FURTHER STUDY

There are a lot more things to study regarding the food waste. Briefly, these can be the next subjects following the studies of this thesis;

1. THE SUPERMARKET DISPLAY AISLES SHOULD BE CHANGED FOR GOOD.

The clients take a lot of information regarding how to keep their produce by seing the already existing way of placement. Throughout this thesis, I have witnessed that some new methods are evolving, like in the pictures on the right, the bananas wait in the supermarket in a hanged way, or the apples stacked with their cardboard box, instead of staking them all together, leaving space in between so that they can keep breathing.
This kind of innovations should be developed more.

2. THE PACKAGING IN SUPERMARKETS WORTHS A WIDER STUDY.

For every item there should be a packaging designed for reusing. As an addition to charging for the shopping bag in the checkout, the small nylon bags in the fruit and vegetable section also should be charged, to encourage using tote bags or other fabric bags.

3. THE WASTE GENERATED IN FOOD SERVICES SHOULD BE OMPROVED.

Although not covered in this thesis, the waste made in the food services are also significant and worth another study. The aesthetic prejudices also apply to them, since the restaurants always want the best products to prepare their dishes. In these strict terms, oversized menus and open buffets and all you can eat tradition are continuing to exist. The 11 billion tonnes of waste they are generating costs 44.8 billion euros annually. The discouragements like charging for the leftover meal on the plate should become more widespread.

The food system is constructed in such a wrong way, there can be major improvements done in almost every element of it.

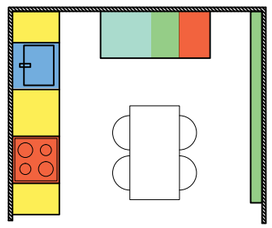
10. Appendix

This part contains the study of IKEA Kitchen types in the Corsico Store, Milan, which the summary can be found in page 84-85.

10.1 SINGLE WALL KITCHEN - EAT-IN KITCHEN

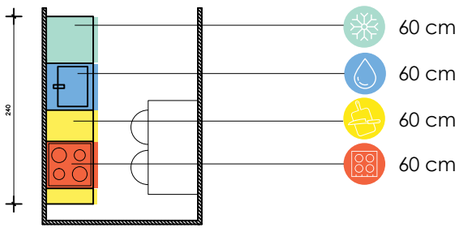
In terms of counter length: 60 cm 60 cm 60 cm 150 cm

1

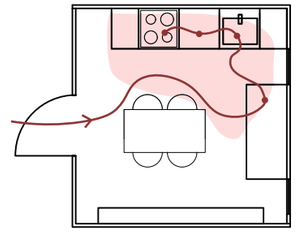
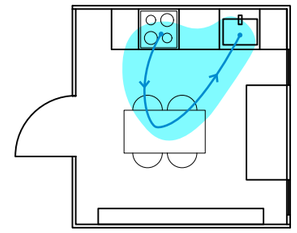
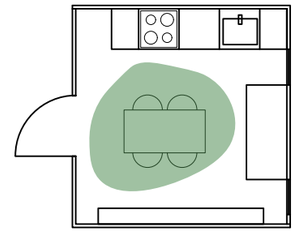
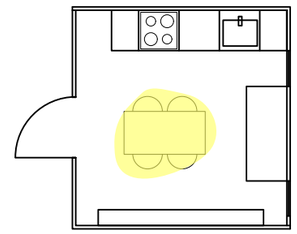
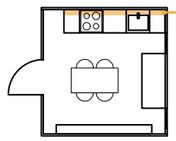
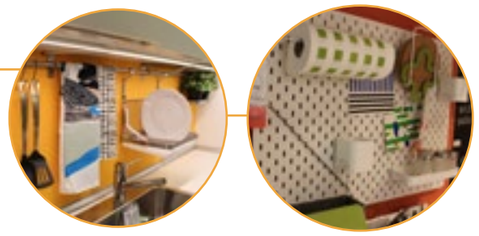


The most popular type of kitchen in IKEA Corsica is the linear eat in kitchen. This type of kitchen is more versatile and has a more rigid division in between the living and the eating space. The first example is a fairly larger kitchen with a linear counter units and an additional cupboard with oven and fridge. The work flow is fridge, sink and oven.
In this kitchen compared to the others there are more space, both as working surface and also as other storage units.

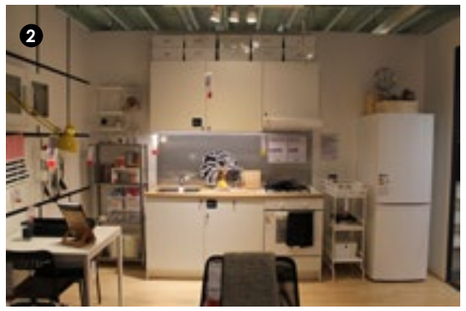
2



The second one is the smallest among all the eat-in kitchens, there is only 40 cm counterspace and a table for preparation area. For the storage of produce, possible zones are, top of the counter, table or hanged on the walls.

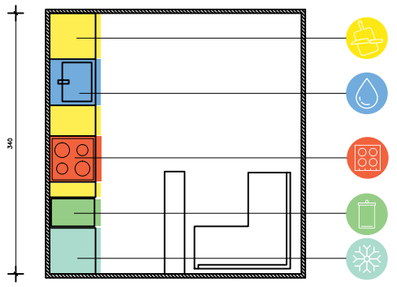
Activity	Visualization	Work Flow & Area
Cooking		
Eating		
Socializing		
Studying & Working		
Storage Ideas		

10.2 SINGLE WALL KITCHEN - OPEN PLAN



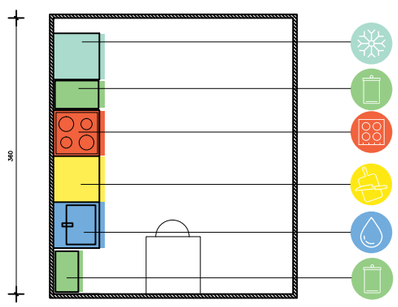
In terms of counter length: 60 cm 60 cm 60 cm 130 cm

1

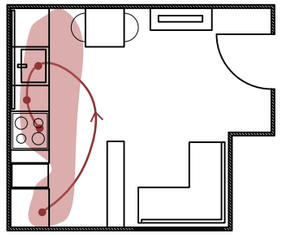
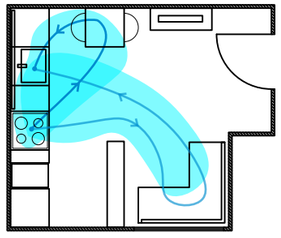


The first example is presenting the longest linear kitchen. Kitchen is included to the living room althought divided with a bookcase. The house is for one or two people as it can be seen from the table.
- Other than the general utilities, there is 120 cm work surface and a provided open storage.
- The work flow is fridge, oven and sink.
- The isn't any possible spots to put vegetables and fruits without gettin in the way of the workflow. Might be hanging on the walls but also the walls are generally quite crowded.

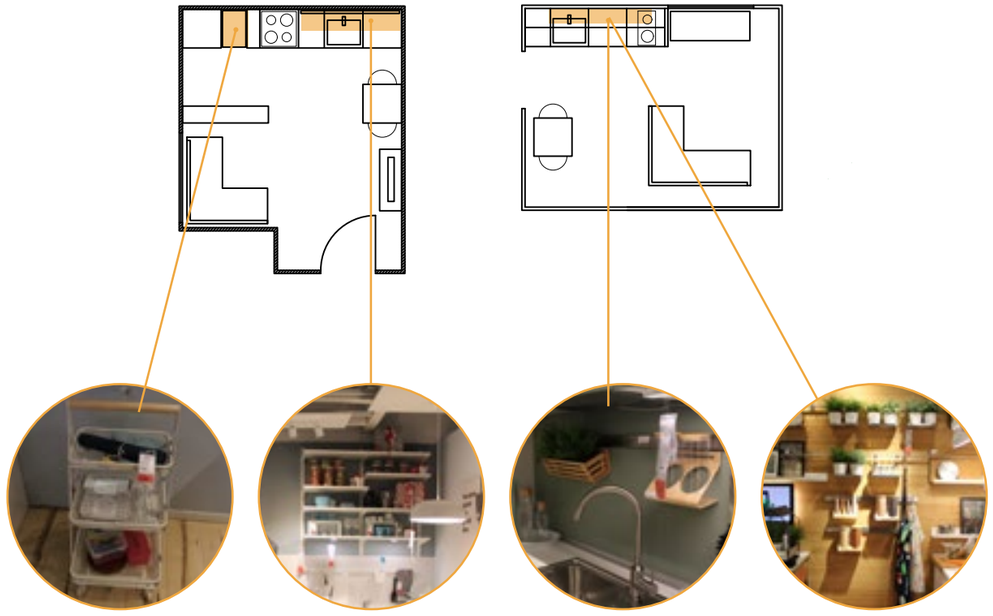
2



The second one is the shortest of the linear kitchens and one of the smallest kitchen in between all the kitchen examples.
- There is only a 60 cm counter space, and several additional storage spaces in total.
- Workflow is fridge, oven and sink as the other examples.
- The possible produce storage can be the walls and the cart with metal grids but depending on the people who live in they might be not sufficient enough.

Activity	Visualization	Work Flow & Area
Cooking		
Eating		

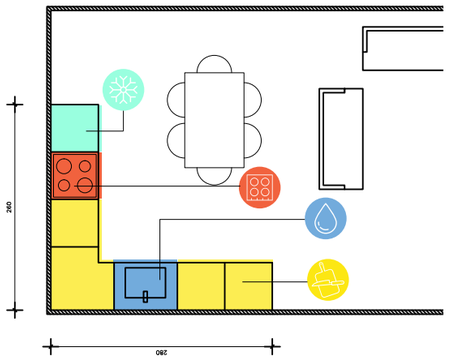
Storage Ideas



10.3 L-SHAPED KITCHEN

In terms of counter length: 60 cm 60 cm 60 cm 260 cm

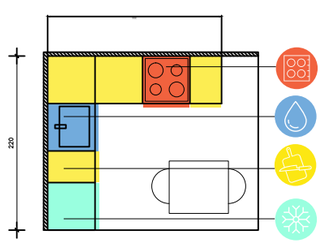
1



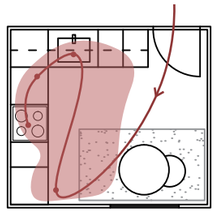
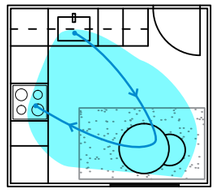
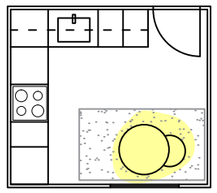
The L shaped kitchens are the second most preferred type, with the availability of creating the work triange it is more ergonomic. The three of the examples are though as eat in kitchens and the

The first kitchen, which is an L shaped kitchen with an open plan, has 240 cm of available counter space which plenty for meal preaperation, all of the example kitchens as visible in the photos has a lot of space compared to the linear kitchens. This gives the consumer to find the right spots for produce stacking.

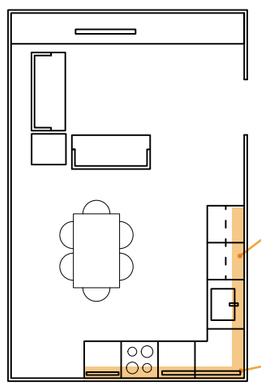
2

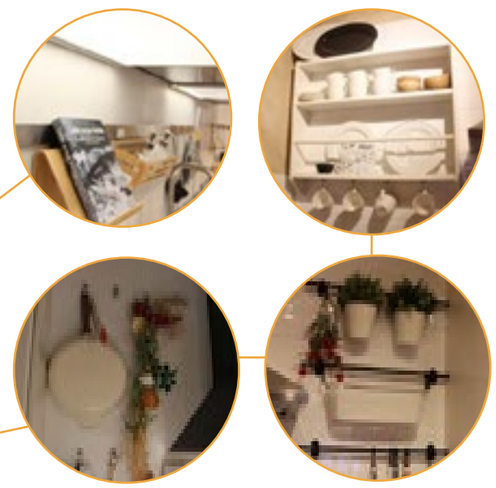


The second example is a eat-in kitchen contructed in a L shape. It has 200 cm of free counter space and a table. Plenty of space in the walls or on the counter to hang or place fruit and vegetables. The work flow is fridge, oven and sink.

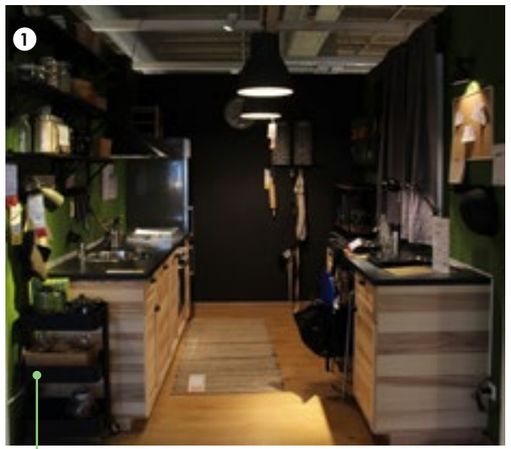
Activity	Visualization	Work Flow & Area
Cooking		
Eating		
Studying & Working		

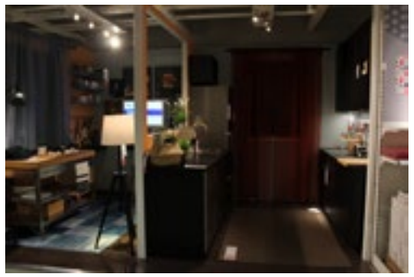
Storage Ideas





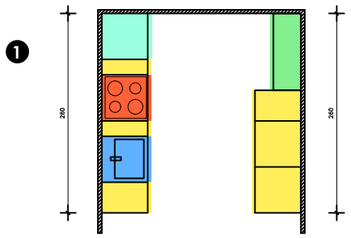
10.4 CORRIDOR KITCHEN





Additional storage space: Bookcase of 100*35 cm and upper shelves

In terms of counter length: 60 cm 60 cm 60 cm 220 cm

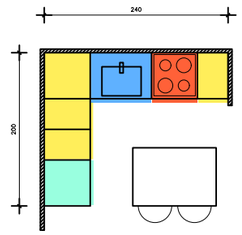


Galley kitchen, has only three examples in the shop. Infact now instead of a gallery kitchen making an L shaped kitchen is more convenient for taking advantage of the space better, in the case that is chosen it is also possible to create an L shaped kitchen, more ergonomic with more surface area and with a table.

The second kitchen is made for a single father according to the information from the IKEA in shop designer and the kitchen is also a small working area. Everything measured to fit the maximum actions in the minimum metresquare.

10.5 ISLAND KITCHEN

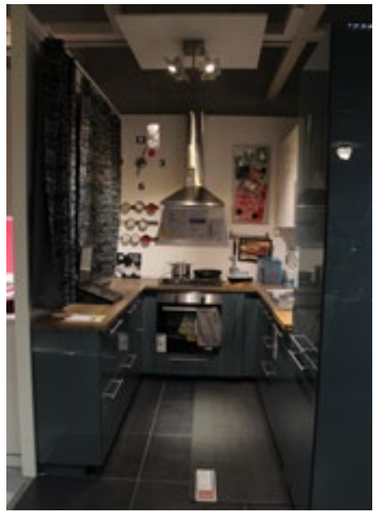
In terms of counter length: 60 cm 60 cm 60 cm 220 cm

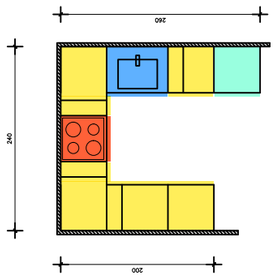


In 2013 everyones dream to have an island kitchen has decreased according to the shop design since there are only two Island Kitchen's in the whole shop, although it is the foundation of the modern kitchens, now to be practical also a table can function as an island, but including the island in this kitchen there is 280*60 cm of working surface which is very convenient.
Here the workflow is fridge,sink and oven.
The possible storage spaces are the walls or on the counter directly.

10.6 U-SHAPED KITCHEN

In terms of counter length: 60 cm 60 cm 60 cm 360





There is only one example from the U shaped kitchen which is a solution to create more counter space and in this example there is 260 cm of counter. The flow is from fridge, sink to oven.

There is a not so much space on the walls to hang the produce storage, since one wall is completely covered with window, but there are available spots in the counters.

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