



SUPPLY CHAIN

- HOW TO PREVENT FOOD WASTE
OF FRESH FRUITS AND VEGETABLES



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Side 13



My name is Justyna.

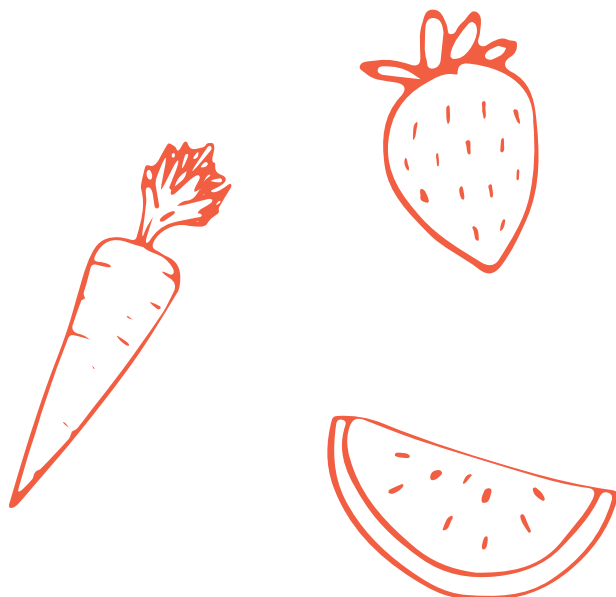
I am a postdoc at Aarhus University, Department of Food Science.

What is a postdoc? After my studies, I have continued in science and obtained a PhD. A postdoc is a position that allows me to continue my training as a scientific researcher and gain skills and experience that are needed in order to pursue an academic career.

I am working on a project about the post-harvest quality of fresh fruits and vegetables, and how to prevent food waste of fresh fruits and vegetables in the supply chain.

In the following material I will show you more about what I am working on.

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Introduction

This module is going to focus on how to prevent food waste of fresh fruits and vegetables.

The demand for fresh fruits and vegetables is growing every day, as we are more and more aware of the health aspects and benefits of eating fruits and vegetables. It is recommended that we eat six portions of fruits and vegetables a day.

We travel more and more, and we are interested in tasting dishes from different countries, also at home.

To ensure a sustainable supply of fruits and vegetables it is better to eat produce that is in season and available locally. However, it is very difficult to refrain from eating nice, tropical fruits and we all like to have a big selection of vegetables during winter.

The longer our produce needs to travel to get to our table, the more chemicals are needed to preserve it in good quality.

We are going to talk about what a supply chain is and how long it can be.

We will make different exercises to understand the importance of packaging and refrigeration in order to prevent food waste.

MINI DICTIONARY

“Product”* (noun) - something that is made to be sold, usually something that is produced by an industrial process or, less commonly, something that is grown or obtained through farming.

“Produce” *(noun) - food or any other substance or material that is grown or obtained through farming.

“Supply chain”* (noun) - the system of people and things that are involved in getting a product from the place where it is made to the person who buys it.

“Local” * (adjective) - from, existing in, serving, or responsible for a small area, especially of a country.

“Seasonal” * (adjective) - relating to or happening during a particular period in the year

“Biodegradable” * (adjective) - able to decay naturally and in a way that is not harmful: Biodegradable packaging helps to limit the amount of harmful chemicals released into the atmosphere

**Cambridge Dictionary*

1. Eat local, eat seasonal

Which fruits and vegetables are in season?

The table below shows which fruits and vegetables are available in different seasons in the climate of Europe.

You may notice that even though some fruits and vegetables e.g. lemon are not in season all year round in the European climate, they are available in the supermarket during all seasons. This means that this produce is produced in a place where the climate is different from the European climate. Either the produce is transported from far away or it is stored for a long time (and most of the time preserved with chemicals) in order for it to be available all year round to European customers.

European seasonal calendar:

SEASON	SPRING	SUMMER	AUTUMN	WINTER
Fruits and berries	Orange Lemon Grapefruit Lime Apple Rhubarb	Rhubarb Apricot Peach Blueberry Blackberry Raspberry Strawberry Cherry Redcurrant Blackcurrant Gooseberry Watermelon Grapes Elderflower	Watermelon Melon Grapes Blackberry Apple Pear Plum Cranberry Elderberry	Pineapple Orange Lemon Lime Grapefruit Mandarin Kiwi Apple Pear

SEASON	SPRING	SUMMER	AUTUMN	WINTER
Vegetables	Cucumber Asparagus Lettuce Carrot Parsley root Parsnip Horseradish Red beet Onion Leek Chives Radish Potato Onion Tomato Spinach Jerusalem artichoke Brussels sprouts	Cucumber Asparagus Lettuce Carrot Parsley root Parsnip Horseradish Red beet Onion Leek Chives Radish Potato Onion Tomato Egg plant Bell pepper Spinach Squash Sugar peas Peas	Cabbage Brussels sprouts Cucumber Lettuce Carrot Parsley root Parsnip Horseradish Red beet Onion Leek Chives Radish Potato Onion Tomato Egg plant Bell pepper Spinach Squash Fennel Celery Cauliflower Broccoli Beans Jerusalem artichoke Kale	Cabbage Brussels sprouts Kale Carrot Parsley root Parsnip Horseradish Red beet Onion Leek Jerusalem artichoke Potato

Practical exercise 1

Make two tables of seasonal fruits and vegetables from the seasonal calendar:

- Danish produce
- Grown abroad

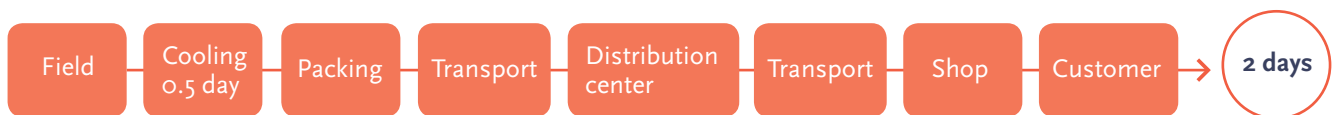
2. What is a supply chain?

A supply chain is the way a produce must go through to get from the field to the consumer.

The question is what system a produce goes through to get to your kitchen from the field?

Below you see the supply chain for:

Danish strawberries from a supermarket



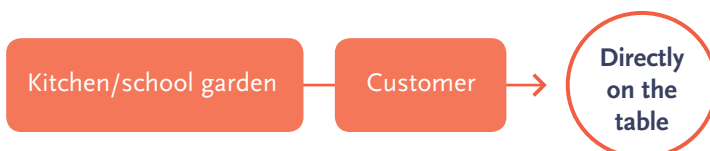
Practical exercise 2

Below you will find four different scenarios for fruits and vegetables traveling from field to kitchen.

Discuss:

- What types of fruits and vegetables go through the different supply chains?
- What could be the country of origin?
- From which of the four supply chains do you usually get produce from?
- Which supply chain would you like to use the most?

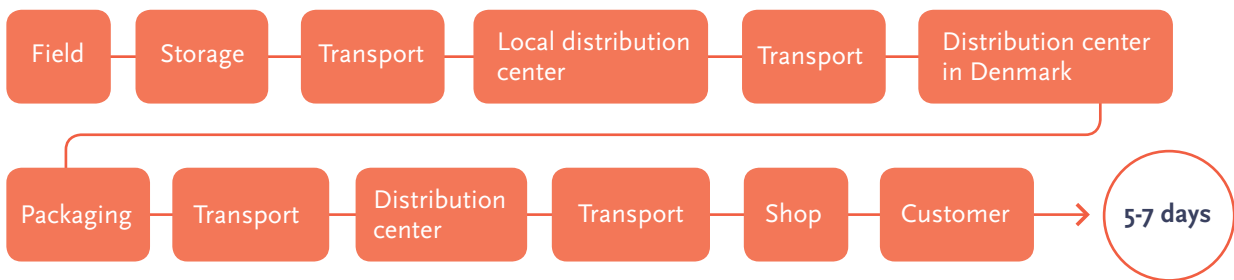
Grow it yourself



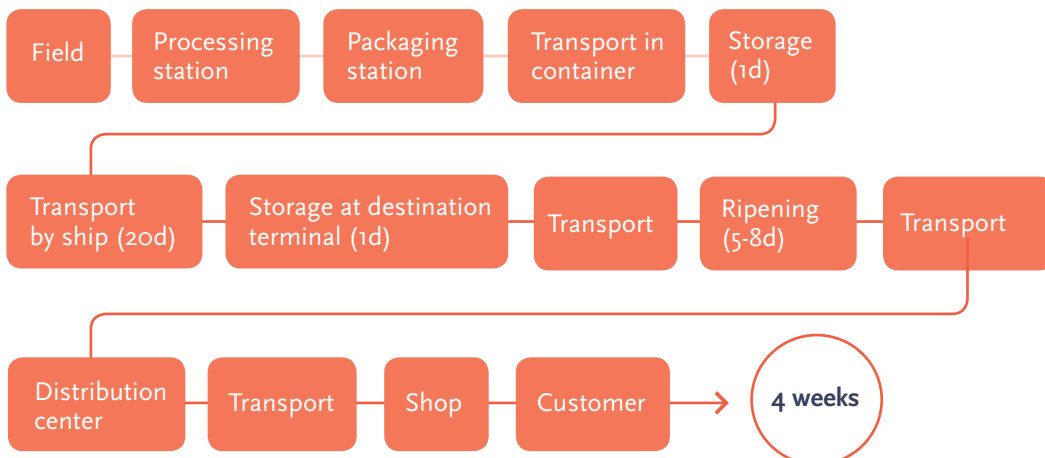
Danish product from a farmer



European produce from supermarket



Tropical produce from supermarket



Practical exercise 3

Visit a local supermarket.

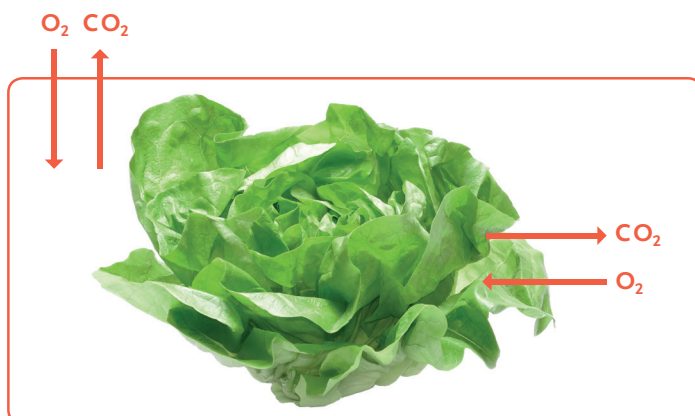
Interview an employee in the supermarket (make sure you have an appointment). Research the fruits and vegetables that are available in the supermarket (be careful with the products).

Interview guide examples:

- What is the current season?
- What fruits and vegetables do you find in the store?
- Where do they come from? How long is the supply chain for the different fruits and vegetables?
- How many of the available products are produced in Denmark?
- Add relevant questions of your own choice.

3. The importance of packaging

Fruits and vegetables are living organisms, and the products undergo various biological processes that continue even after the product is harvested. An important part of this process is the product's respiration. The fruit or vegetable "breathes" through its ripening process. The process depends on many factors. The temperature has a great influence on the quality of fresh fruits and vegetables after harvest. Packaging can help to control this process and keep the vegetables fresh for a longer time. When fresh fruits and vegetables breathe, the product consumes oxygen and secretes carbon dioxide, water and heat. Thereby, carbohydrates are broken down and the product gradually loses its juice and power.



“Packaging are all products made of any materials of any nature to be used for the containment, protection, handling, delivery and preservation of goods from the producer to the user or consumer”
(Directive 94/62/EC)

The main function of packaging is to preserve and protect the product. Nowadays we are trying to reduce the use of plastic in everyday life due to an increased awareness of environmental issues. Packaging does not necessarily mean plastic. There is an alternative solution to plastic - namely BIODEGRADABLE materials.

Packaging material is considered biodegradable if it can degrade into water, carbon dioxide and biomass in a specific time (stated by different standards). It is important to understand that not all bioplastics are biodegradable. An example of a non-biodegradable bioplastic is bio-based PET.

Though packaging materials may look the same at first sight, their properties may differ substantially - e.g. BOPP and PLA. See the picture below.



BOPP (biaxially-oriented polypropylene). It's a variant of polypropylene (PP). It is commonly used as plastic film for packaging of fresh fruit and vegetables.

BIOPLASTIC - bio-based and biodegradable packaging film, alternative to commonly used materials, it is not fully transparent.

PLA (Polylactic acid) - most commonly used packaging material from renewable resources, fully transparent, hard and noisy.

Practical exercise 4

- 1 Buy 3 kilos of carrots
- 2 Place 1 kg of carrots on a plate
- 3 Put 1 kg of carrots in a tight bag
- 4 Put 1 kg of carrots in a tight bag and make 30 holes with a needle/pin
- 5 Use kitchen balance to weigh all 3 samples
- 6 Store samples at room temperature for 14 days
- 7 Observe what changes there are to the carrots, note them down and discuss the changes

SAMPLES	WEIGHT (G) - DAY 0	WEIGHT (G) - DAY 7	WEIGHT (G) - DAY 14
Carrots place on a plate			
Carrots closed in a tight bag			
Carrots closed in a tight bag with holes			

Make notes on what you have observed:

- How much weight have the samples lost? (Weight loss = weight day 0 - weight day 7 (or 14))
- Has the packaging (or lack of it) caused loss of weight?
- On day 14 open the packages, smell and touch the carrots. What do you observe?

4. The importance of refrigeration

Most fruits and vegetables should be stored at a temperature between 5 and 8°C. Lower temperatures will cause damage due to chilling and will ruin the produce. Higher temperatures will lead to higher respiration of the produce which will make its shelf life shorter. Higher temperatures will also allow spoilage bacteria and fungi to grow.

Practical exercise 5

- 1 Buy two packages of strawberries or broccoli (depending on the season)
- 2 Keep one package at room temperature (20°C)
- 3 Keep one package in the fridge (5°C)
- 4 Store for 7-10 days
- 5 Make notes on any observable changes during the storage
- 6 Discuss in class how important refrigeration is.

5. Organic produce

What does it mean that the produce is organic?

“ORGANIC” means that the produce comes from organic production in accordance with Regulation (EC834/2007 and EC 889/2008)

ORGANIC = certified

In Organic production there is:

- No use of agrochemicals during production (there might be a higher microbial load which may cause faster spoilage of the produce)
- Limited processing aids which may lead to higher food waste
- Control of the production process, not the final product

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*Dette undervisningsforløb er udviklet i et samarbejde
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