LOWINFOOD

Multi-actor design of low-waste food value chains through the demonstration of innovative solutions to reduce food loss and waste

GA No. 101000439

D3.3 Training concept bakery optimization

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LOWINFOOD Consortium

N.	Full name of the organisation	Short name	Country
1	Università degli Studi della Tuscia	UNITUS	Italy
2	Alma Mater Studiorum Università di Bologna	UNIBO	Italy
3	Sveriges Lantbruksuniversitet	SLU	Sweden
4	FH Munster University of Applied Sciences	ISUN	Germany
5	The James Hutton Institute	JHI	United Kingdom
6	Universitaet Fuer Bodenkultur Wien	BOKU	Austria
7	Tampereen Korkeakoulusaatio SR	TAU	Finland
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21	Uppsala Kommun	UPP	Sweden
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24	Confederazione Nazionale dell'Artigianato e della piccola e media impresa Associazione di Viterbo e Civitavecchia	CNA	Italy
25	Assemblee des Regions Europeennes Fruitieres Legumieres et Horticoles	ARE	France
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27	Iridanos-Inabelos Anonymi Etaireiatouristikes Ksenodoxeiakes Kai Agrotikes Epixeiriseis	THA	Greece

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Summary

This deliverable is a training concept for bakery staff, which prepares the potential users to apply artificial intelligence-based forecasting software. Such tools are applied to optimise bakeries' order management by better fitting the order quantity of bread and bakery products to the actual demand in the bakery shops. This reduces overproduction and minimizes returned bakery products and thus food waste in the bakery trade. As the forecasting software relies on past sales data, the availability of digitalized and clean sales data and data of returned bakery products from the past is crucial. Moreover, resistance of staff towards the use of digital tools needs to be overcome. The objective of this training concept is to reduce the hurdle to apply digital forecasting tools in the bakery trade. This training concept is targeted to sales staff in bakeries, but is also applicable for other employees in a bakery, such as bakers or employees in management positions. The concept at hand comprises the learning material for participants of the training course "Reducing returned bakery products and promoting sustainability - Preparing employees in bakeries for the use of digital forecasting tools", and the workshop concept for the trainers of the course.

Introduction to the deliverable

LOWINFOOD is a project committed to co-design, together with actors of the food chain, low-waste value chains by supporting the demonstration of a portfolio of innovations in a set of value chains particularly concerned by food loss and waste (fruits & vegetables, bakery products and fish), as well as in at-home and out-of-home consumption. Each of these value chains corresponds to a single Work Package (WP) of the project.

The innovations are selected among promising solutions that have already been developed and tested by some partners of the consortium, with the aim to provide the necessary demonstration and upscale to allow market replication.

The LOWINFOOD consortium comprises 27 entities, located in 12 different countries, and ranging from universities and research institutes to start-ups, foundations, associations, and companies working in the food sector. During the 52 months of the project, the partners are committed to complete 30 tasks and to deliver 60 outputs (deliverables).

This deliverable belongs to WP3. The objective of this work package is to reduce the waste of bread in the supply chain from bakeries. D3.3 is embedded in the context of Task 3.3 where a forecasting software (FoodTracks) is applied to optimize bakeries' order management. This is achieved by fitting the order quantity better to the actual demand in the bakery shops. The term 'order quantity' refers to the quantity of bakery products that is ordered by the bakery shops from the central production site of the baking company. The aim is to reduce overproduction and minimize returned bakery products from the bakery shops to the central bakery's production site. The forecasting software uses an algorithm to forecast order quantities based on past sales data and data of returned bakery products. The order proposal provided by the software is further based on the analysis of other variables such as weather conditions or special occasions (e.g. upcoming holidays). A mandatory requirement to successfully use the software is the availability of digital sales data from the past. I.e., the bakery staff needs to understand, why it is important to enter sales data into the existing ERP or cashier system properly. Another crucial aspect of a forecasting software's success is its acceptance by the users. Hence not only the quality of the data accessed by the software, but also the user itself and the organisational context where it is applied need to be regarded when developing the innovation further.

This deliverable is a training concept for bakery staff which prepares the potential users to apply artificial intelligence-based forecasting software. The training concept is targeted to sales staff in bakeries but is also applicable for other employees in a bakery, such as bakers or employees in management positions. The training concept can be used as part of the vocational training for bakery staff and or in measures dedicated to vocational education and training for sustainable development for this sector. Moreover, it can be used by forecasting software providers who offer training to their potential users. The concept at hand comprises these two parts:

a. Workbook for participants of the training course "Reducing returned bakery products and promoting sustainability - Preparing bakery staff for the use of digital forecasting tools"
b. Workshop concept for the trainers of the course (e.g. teachers from vocational schools or further education institutions, trainers of forecasting software providers).

1. Workbook "Reducing returned bakery products and promoting sustainability - Preparing employees in bakeries for the use of digital forecasting tools"

The workbook consists of a total of three modules built on each other. The module contents help the user to deal with the topic of sustainability in bakeries. The topic of digitalisation is addressed in the context of sales management and sustainability and specifically how returned bakery products in bakeries can be reduced using digital forecasting tools. These modules take into account the day-to-day processes and challenges in the bakery trade and help to develop practical solutions.

Module 1 "Sustainability in the bakery trade"

The core contents of this module comprise the basic concept and models of sustainability and their significance in the local and global context. Furthermore, it is shown why more sustainable action is also essential in the bakery trade for the success of the company and the preservation of the health of the planetary habitats.

Module 2 "Merchandise management in the bakery trade"

The core contents of this module are the basics of merchandise management in bakeries with the aim of more sustainable management. Particular focus is placed on ways to reduce returned bakery products in bakeries. The necessary data that must be collected as a basis for order optimisation by the sales staff in the bakery shops is discussed and instruments are presented that can be used to document and evaluate this data.

Module 3 "Digitalisation in the bakery trade"

The core content of this module is digitalisation in the bakery trade. It explains why digital applications can be useful in organisational processes such as ordering. In addition, the opportunities and hurdles of digitalisation in the bakery trade are presented here.

2. Workshop concept

The workshop concept is targeted to trainers for the course "Reducing returned bakery products and promoting sustainability - Preparing employees in bakeries for the use of digital forecasting tools". It shows the structure of the training unit, including the proposed schedule of the workshop day and methods applied. The workshop is planned as a full-day course. In general, the workbook also offers enough material to spread the course over one and a half days.

The concrete time and methodological implementation should be planned by the trainers (e.g. teachers from private or public organisations active in the field of vocational training or education for sustainable development but also training personnel from forecasting software providers) depending on the group of participants (e.g. composition, age, function in the bakery) and the available spatial and technical infrastructure.

3. Implementation and dissemination

The target group of the workshops comprises all employees in bakeries who directly need to work with a forecasting software for order optimization or who contribute to providing the necessary data (such as data on sales or returned goods). This group encompasses both: employees from strategic as well as from operative positions, such as sales staff.

The workshop can be integrated into the portfolio of the further education offers provided by the LOWINFOOD partner ADB Nord. It will be translated into German for this purpose. In addition, it is planned, that the workbook and the workshop concept will be freely available for download on the LOWINFOOD website and on ISUN's website. Hence, interested actors from other countries (e.g. from the field of vocational training or vocational training for sustainable development) have the possibility to use the material free of charge, to translate it into their respective languages, and to adapt it to their specific purposes. In order to facilitate this process, the Creative Commons license CC BY-NC-SA 4.0 was chosen to publish the material. This license is for non-commercial use only and ensures that appropriate credit is given to the original authors. SA refers to the option that the user can remix, transform, or build upon the material, but must distribute the contributions under the same license as the original.

Annex 1: Workbook

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REDUCING RETURNED BAKERY PRODUCTS AND PROMOTING SUSTAINABILITY

Preparing bakery staff for the use of digital forecasting tools

LOWINFOOD

Imprint

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Reducing returned bakery products and promoting sustainability -
Preparing employees in bakeries for the use of digital forecasting tools

Foreword

This document is the workbook for the seminar **"Reducing returned bakery products and promoting sustainability - Preparing bakery staff for the use of digital forecasting tools"**. Here you can write down your thoughts and record the results of your work, or read it again if you want to go into something more deeply afterwards.

The seminar consists of a total of three modules built on each other. The module contents help you to deal with the topic of sustainability in bakeries. The topic of digitalisation is addressed in the context of merchandise management and sustainability and specifically how returned bakery products can be reduced using digital prediction tools. These modules take into account the day-to-day processes and challenges in the bakery trade and develop practical solutions.

The seminar was developed within the framework of the European research project LOWINFOOD, which is funded by the Horizon 2020 programme (duration 11/2020 - 02/2025, funding code 101000439, www.lowinfood.eu). The aim of the LOWINFOOD project is to reduce food losses and waste along the value chain in bread and bakery products, fruit and vegetables and fish, as well as in the consumption of food in the out-of-home catering sector and in private households. Researchers, businesses and other relevant actors are

working together on this project. They are testing innovative approaches to reduce waste in the European food system and assessing their impact on sustainability. This workbook was produced in cooperation with the three project partners - *Akademie Deutsches Bäckerhandwerk Nord gGmbH*, *FoodTracks Antegon GmbH* and the *Institute of Sustainable Nutrition, Münster University of Applied Sciences.*

The modules at a glance:

Module 1 - Sustainability in the bakery trade
The core contents of the first module are basic concepts and models of sustainability and their significance in the local and global context. Furthermore, it is highlighted why more sustainable action is also essential for the success of the bakery trade and for maintaining the health of the planetary habitats.

Module 2 - Merchandise management in the bakery and its contribution to more sustainability
Module 2 covers the basics of merchandise management in bakeries with the aim of achieving more sustainable management. The focus here is particularly on ways to reduce returned products and hence food waste in bakeries. The necessary data, which must be collected as a starting point by employees in the shops, is discussed. In addition, instruments are presented that can be used to document and evaluate this data.

Module 3 - Digitalisation in the bakery trade
The third module deals with digitalisation in the bakery trade. It lists why digital applications can be useful in organisational processes such as ordering. In addition, the opportunities and hurdles of digitalisation in the bakery trade

are presented here. The link to the topic of sustainability is also presented in this module.

Structure

The three modules are all structured in the same way: At the beginning of each module you will learn about the **learning objectives**. This is followed by a **case study that** accompanies you throughout the module. This practical example serves to clarify **theoretical contents** through situations from everyday work in bakeries. In the modules you will find **different work assignments, which** you can work on alone or in a group. In addition, **further materials** (video links, information texts, etc.) are included in the form of information boxes or QR codes, which you can use to delve into certain topics.

Legend

✏️ Write something down

👁 Look at something

🖩 Calculate

Exchange ideas in groups

💡 Additional information

💭 Think about something

🔍 Further information on the topic

👍 Thumbs up

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MODULE 1

SUSTAINABILITY IN BAKERIES

Sustainability affects us all - privately as well as professionally! Through our actions at work, we have the opportunity to make decisions in harmony with socially responsible and environmentally sound behaviour. But what does operating more sustainably in the workplace actually mean? After all, the company's success depends on every action and must be economically viable. This module provides an introduction to the topic of sustainability and sets out the connections that go hand in hand with action in the bakery trade. It is shown that a sustainable business orientation, in which entrepreneurial decisions are made in the sense of sustainable development and processes are carried out sustainably, is by no means contradictory to the economic success of a company. Efficient, environmentally friendly and socially responsible actions can strengthen a company's competitive position.

1. Sustainability in bakeries

1.1 Learning objectives

After completing the module, you can...

- explain what the terms sustainability and sustainable development mean,
- explain what the Sustainable Development Goals (SDGs) and the dimensions of sustainability are,
- highlight the impact of entrepreneurial action in bakeries on the three dimensions of sustainability (environment, economy and society),
- contrast the advantages and disadvantages of regional and global raw materials and supply chains.

1.2 Case study: Superfoods and sustainability at "Delicious Daily"

At the bakery "Delicious Daily", the chia bun is the best seller! But with the next deliveries to the bakery shop, Jason, the bakery's salesperson, notices that these very rolls are no longer there. What happened here? His boss Marta has found out - the bakery is having problems buying the raw material chia seed. In the South American growing countries, droughts and storms have meant that the harvest quantities have been much lower than planned! The price of the superfood has therefore risen sharply. A few days later, when the rolls are back in the assortment, Jason is repeatedly asked by customers about the higher sales price.

Jason is worried:
Why do businesses buy chia seeds that have been produced so far away?
Isn't it better to buy raw materials from the local area anyway?

Read the following chapters to find out how the case study relates to sustainability.

1.3 Introduction to sustainability

The term sustainability is more present in the media today than ever before. It is not only in the energy sector that sustainable action is necessary to generate enough electricity and heat for everyone. In the best case, one uses energy from renewable sources, such as wind or solar energy. In contrast, energy from fossil fuels, such as oil or coal, is used up at some point and heats up the atmosphere. In the food industry, too, which includes the bakery

trade, sustainable action can secure food for people in the future in the long term and contribute to keeping nature and people healthy.

Already several decades ago (1987), the World Commission on Environment and Development dealt with how the world can be made sustainable. Of particular importance was that **sustainable development should meet the needs of today's society without compromising the needs of future generations** (Brundtland Report). This means that the needs of the world's population today and tomorrow should be considered equal. In particular, the satisfaction of the (basic) needs of poor populations should be given top priority. The people living on earth should all have the same opportunities and possibilities to at least satisfy their basic physiological and safety needs such as having a shelter to sleep in a safe place, and access to food and water, sanitation and medical care, clothes and electricity. A high consumption of resources at the expense of nature, living beings and future generations leads in the long run to the loss of the basis of life and thus also of economic activity. The goal of individual and

For more on the Brundtland Report and the concept of sustainable development, s

https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

What does resource consumption mean?
This refers to the use of raw materials, land, air and energy sources as well as water.

Task 1a: Self-reflection on the term "sustainable action":
You now know what the term "sustainable development" means. What does it mean to you personally? Is there anything you are already doing more sustainably in your life or business?

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societal action should be to preserve a just, livable and viable living space for people, animals and nature.

Jason also asks himself what exactly constitutes sustainable action. And above all, how the bakery business he is working for can operate sustainably so that such problems with the raw material chia seeds no longer occur in the future.

The sustainability triangle explained below will first help you to understand what sustainability means and encompasses in concrete terms:

Sustainability triangle

The term "sustainability" always encompasses at least three areas: **economy, environment and society.** There are several models that are suitable for illustrating the term sustainability and the three dimensions. What is meant by the terms and how can such a model look like? Take a look at the following Figure 1 on the sustainability triangle:
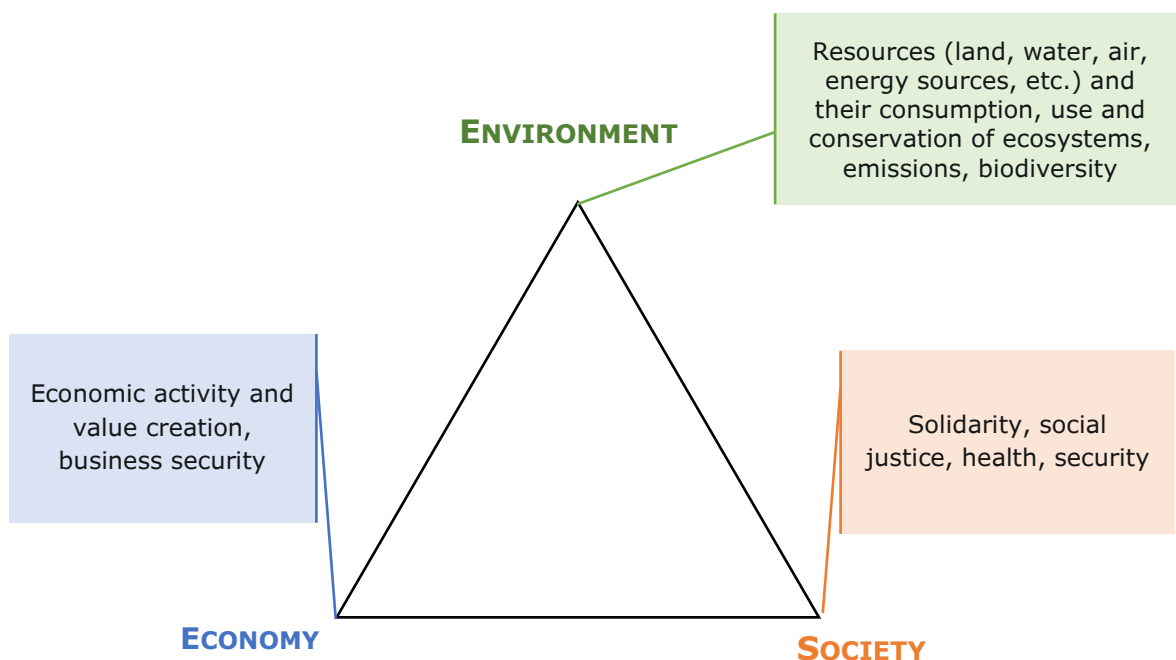

Figure 1: Exemplary components for the dimensions of the sustainability triangle (own illustration)

In the best case, the three areas of environment, society and economy should be in balance with each other and considered to be of equal value. This is also shown by the fact that the edges of the triangle are all the same length. In addition, the dimensions are connected to each other by the lines. Thus, an action in the area of economy always has an impact on the two other dimensions, environment and social issues, and vice versa.

Environmentally sustainable action includes the economical use of resources. These include raw materials, land, energy, water and air. For example, energy sources such as oil, gas and coal, energy consumption in general, but also the fresh water available in the world should be used carefully. The reduction of climate-impacting emissions, such as CO_2, also corresponds to environmentally sustainable action. In general, people's actions should not harm nature, but preserve ecosystems, their biodiversity and thus the habitat of humans and animals.

Socially sustainable action includes keeping people healthy and able to meet their needs without depriving other people of this opportunity today and in the future. Because: Every life in the world is worth living - consequently, the same right to satisfaction of needs should apply to all. This also includes ensuring that people can support themselves and their families through fairly paid work.

Economically sustainable action takes into account that companies can secure their economic activities in the long term. In this context, it is important that flows of goods are designed to be as resource-efficient as possible; after all, raw materials, land and energy sources, for example, are only available in limited quantities on earth. If these resources are used up at some point, they are no longer available for operations. This can jeopardise operational activities. Accordingly, attention should be paid to the use of

renewable and sustainable resources in order to ensure the company's success in the long term.

Task 1b: Reasons for and effects of droughts in the Chia growing area on the dimensions of sustainability

Look at the case study from above again. Now consider to what extent the dimensions of sustainability - the environment, the economy and the society - are affected by the situation in the bakery "Delicious Daily".

1. What reasons could have led to the devastating droughts and severe weather events in the country where chia seeds are grown?

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2. Plot the effects of the drought in the growing area and the associated loss of supply in the sustainability triangle below in the fields for environment, social issues and economy.

ENVIRONMENT

ECONOMY   SOCIETY
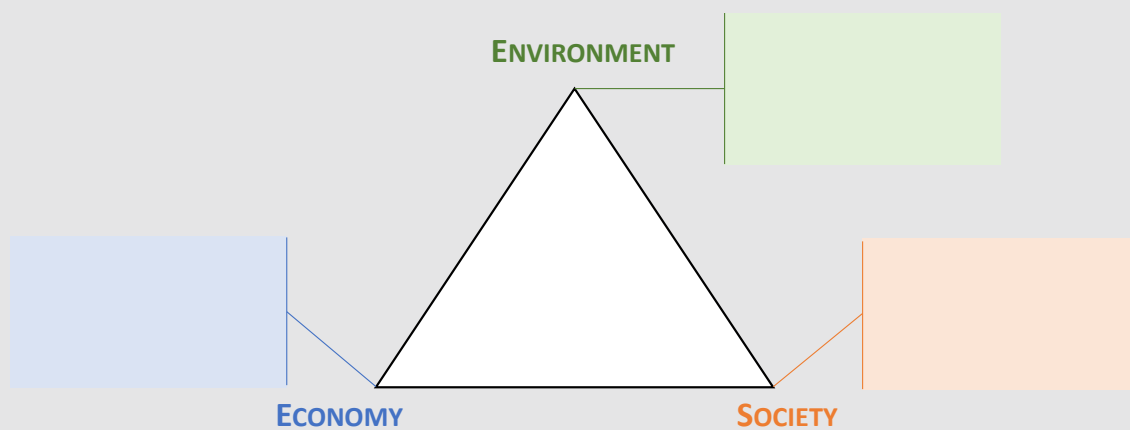
1.4 Sustainability - global and local

1.4.1 Global Sustainable Development Goals (SDGs)

In order to not only have what sustainable development means for the world written down on paper, but also to put it into practice, the United Nations (UN) set concrete goals in 2015: **The Sustainable Development Goals** (SDGs). There are a total of 17 overall goals, which are further subdivided into 169 more concrete sub-goals. The aim is to achieve the goals worldwide by 2030. The

Who are the United Nations?
The United Nations, also known as the World Community, is an alliance of 193 countries worldwide. The organisation has committed itself to maintaining world peace, respecting human and international rights and strengthening international cooperation. Click here for the explanatory video:

https://youtu.be/E67ln5yJtyE

Want to see more about the SDGs?

https://sdgs.un.org/goals

individual countries are responsible for their implementation. Each participating country is responsible for setting up various action plans. These should contribute to the goals being translated into practical action.

The SDGs focus on the three dimensions of sustainability (environment, economy, society). A wide range of areas are covered in each dimension, such as education, life on land, poverty and hunger reduction and many more. Figure 2 below shows all 17 goals:

Figure 2: The 17 Sustainable Development Goals of the 2030 Agenda for Sustainable Development (Source: https://www.un.org/sustainabledevelopment/news/communications-material/)

Task 1c: SDGs in your own business

Take a closer look at the SDGs. Which of them could be relevant for your business? Where does your company already act sustainably? To which of the SDGs can this be assigned?

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1.4.2 Regional procurement of goods

A lot of cereals are grown in Europe. Above all, cereals such as wheat, barley, maize, rye, triticale and oats are cultivated in there. The grain is processed and used in the countries, but also exported abroad. In addition, oilseeds are

cultivated in agriculture. These include sunflower seeds, for example, or linseed in Germany. These sound like versatile raw materials for baked goods, don't they?

Raw materials from abroad often have to be transported a long way to end up in the bakery. Long transport routes emit a lot of CO_2 emissions. Depending on the country of cultivation and the raw material, different means of transport such as planes, ships, trains or trucks are needed. If there is an economic or other crisis in the country of cultivation, the supply chain may collapse. Furthermore, it is often not clear under which ecological and social conditions the raw materials are grown abroad.

In the context of sustainability, **regional sourcing of raw materials has** several advantages: at best, you know exactly where the raw materials come from. If the cultivation and processing take place in your own country or in neighbouring countries, the ecological footprint during transport is smaller than for raw materials from far away. In addition, workers in agriculture and processing companies are subject to a certain level of occupational health and safety. This means that the employer is responsible for promoting the health of the workers. In certain cases, the employer is obliged to provide protective measures such as work clothes in the field when using plant protection products.

Moreover, in the case of linseed as a regional alternative to chia seeds, the purchase price per kilogram is lower. Buying regional products strengthens the regional economy. In the best case, this leads in the long term to a greater variety of grains and oilseeds being grown within Europe, as the demand is there.

Task 1d: Superfood and regional sourcing

1. First of all, watch the video on chia seeds:

https://youtu.be/I0CXhmdHPfI

2. Think about why chia seeds are a so-called superfood.

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3. Why are chia seeds used in bakeries at all? Discuss this in the group and write down your thoughts.

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4. Think about the advantages and disadvantages of chia seeds.

Note: Here you can refer to health aspects but also think about the advantages and disadvantages of processing in bakeries.

Advantages	Disadvantages

5. Consider in the group how the Delicious Daily bakery can deal with the problem of the increased price of chia seeds.

Assistance: Are there alternative raw materials here that could be used instead? How can the Delicious Daily bakery act more sustainably in the future to support agriculture?

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And now back to the case study: Why is sourcing chia seeds less sustainable than using flax seeds?

Case study: Superfood and sustainability

Jason and Marta now realise: If we want to use a special type of grain or seeds from abroad, it must be ensured that their production in agriculture is not harmful to the environment today and also in the future. In addition, working conditions should be fair, i.e. the work in the fields or plantations should not be associated with a risk to health and should be adequately remunerated. To achieve this, every person and every company bears responsibility.

In the following, the contents learned are applied again to the case study. For the three dimensions of sustainability, it is explained which events led to the scenario in the bakery "Delicious Daily" and what effects this can have on the supply chain and the range of goods in bakeries. In addition, approaches to solve the problem are shown.

DIMENSION: ENVIRONMENT

Causes and effects

In our example, there are several causes that contribute to the fact that chia seed harvest volumes have collapsed. On the one hand, the higher demand for chia seeds leads to an expansion of the cultivation area in the South American growing countries. New land is being made usable, for example through slash-and-burn clearing of rainforests or conversion of permanent grassland. This leads to a loss of biodiversity (lower numbers and species of all living organisms, such as plants and animals). It also releases other climate-damaging greenhouse gases, which contributes to an increase in severe weather events. Chia seeds are often grown in monocultures. This means that only one plant species is cultivated on the same area for several years. This has many ecological effects. For example, the protective humus layer on the soil can be eroded more easily, rainwater seeps away less easily and the soil can absorb less water. The improper use of pesticides also contributes to the impairment of the fertile, crumbly and water-retaining structure of the soil. Floods can then cause crops to rot in wet fields. Droughts in growing areas put the soil and plants under additional stress and thus reduce yields. This often sets in motion an undesirable climate-damaging spiral: the soils are not sustainable enough for new seeds for a long time, and declining yields on unproductive fields lead once again to an expansion of the cultivated area. In addition to the cultivation conditions, the long transport routes from abroad to the processing site also have negative consequences for the environment. This is because the CO_2 emitted during transport is partly responsible for climate change.

Approaches

Regional procurement of raw materials reduces transport distances and thus also CO_2 emissions through delivery. The use of organically produced raw

materials is also advantageous. This is because it promotes a form of agriculture that ensures that the soils are loose and rich in humus and thus better able to withstand storms. For example, they have a higher capacity to absorb water and are better able to withstand heavy rainfall and periods of drought. In addition, humus-rich soils bind CO_2 and thus counteract climate change.

DIMENSION: SOCIETY

Causes and effects

All people along the value chain should be paid fairly and be able to live from their work. The value chain includes all the steps that are necessary to produce our food. It includes the agricultural production of raw materials, their transport, processing and sale in retail. The income of all workers in these areas must be sufficient to enable people to buy food and medicine and to send their children to school. If working conditions are not fair, this can lead to people becoming ill as a result of their work, or to them leaving to look for better jobs or even a better life at home or abroad. In our example, the improper use of pesticides or the failure to wear protective clothing can cause agricultural workers to suffer poisoning or become chronically ill. Floods or droughts can make agricultural land unusable. This puts workers at risk of poverty, as they may lose their jobs and/or livelihoods.

Approaches

Purchasing fairly produced raw materials ensures that all participants along the supply chain receive fair remuneration. Sourcing organically produced raw materials reduces the risk of workers falling ill due to the use of pesticides in field work.

DIMENSION: ECONOMY

Causes and effects

Natural disasters and other production losses can cause the price of raw materials to rise significantly, as in the case of Chia seeds or important cereals. The environmental costs caused by natural disasters are borne by the general public, for example in the form of taxes for the elimination and prevention of environmental damage. In the case study, the purchase price of Chia seeds increases, which also leads to a price increase for the end product, which is ultimately paid by the customers. Price increases can also be a burden on people in economically weaker growing countries, because they are also asked to pay higher prices for the products, which they often cannot afford.

> **What are environmental costs?**
>
> This refers to costs that arise from environmental impacts. In the case of food, this refers to all the negative impacts on the environment that occur during its production along the entire value chain. This includes their agricultural production, transport or further processing and marketing. Environmental costs include, for example, costs for necessary cleaning measures of drinking water after improper use of pesticides in agriculture. Environmental costs also include the costs of repairing storm damage, which is occurring more frequently due to climate change.

The purchase price of raw materials must ensure that manufacturing companies such as bakeries can still process them profitably or produce a saleable product from them. If supply chains break down or there are production stoppages, the companies must look for alternatives as quickly as possible in order to continue to offer their customers an attractive range of goods.

Approaches

Regional raw materials may be a cheaper alternative for the wallet. It should be examined whether raw materials can be usefully replaced by regional alternatives. In our example, linseed is an alternative.

It becomes clear here that all three dimensions are interconnected and even dependent on each other. Thus, your actions and the actions of your bakery are also in a network of effects. Of course, there is not always a perfect solution (e.g. the conventional production of flax seed may also use a lot of pesticides and negatively affects the soil and biodiversity, or a reduced demand for chia seeds may increase unemployment rate in respective countries). **Sustainable action must always be reviewed and adapted to the individual situation.**

1.5 Practical example: Sustainable management in bakeries

The following practical example shows what sustainable management can look like in the bakery industry, both in production and in the use of energy sources. For more information, check out the company's website.

Bakery "Schüren" and the company's own "Seed & Greet" concept

The German bakery Schüren has made the company more sustainable and at the same time created a new distribution channel with the innovative "Seed & Greet" concept. The bakery sources regional as well as organic raw materials and processes them into high-quality products. The goods are delivered by electric vehicles. Bread scraps are upgraded to breadcrumbs or reprocessed into bread. In addition to a wholefood product line, the bakery also sells vegan products. The "Seed & Greet" branch is a bistro on the motorway where the bakery products are sold. In addition, the bistro offers on-site charging stations for electric vehicles. This makes sustainable food more accessible to customers.

More info at (in German):
https://www.ihr-bäcker-schüren.de/

1.6 More information

Take a look here:

- More information on the SDGs
    - What are the SDGs (in German):
      https://www.youtube.com/watch?v=rnjcyrzZNRs
    - SDGs in Germany (in German):
      https://www.bundesregierung.de/breg-de/themen/nachhaltigkeitspolitik/nachhaltigkeitsziele-erklaert-232174
    - Individual SDGs explained in more detail (in German):
      https://sdg-indikatoren.de/

- Explanation of the sustainability triangle
  https://www.youtube.com/watch?v=TAIJS-qG66s

- Other models of sustainability
  https://www.youtube.com/watch?v=JJqmYFaNMN0

- Local vs. exotic superfoods:
  https://www.youtube.com/watch?v=LQPzMZeAvqM

- Sustainable Superfoods:
  https://www.youtube.com/watch?v=M-iJM02m_Hg

- Linseed vs. chiaseed:
  https://www.youtube.com/watch?v=ZFyqYwY5pBE

- Sustainability explained:
  https://youtu.be/_5r4loXPyx8
  https://www.youtube.com/watch?v=2f5m-jBf81Q
  https://www.youtube.com/watch?v=mz96RXVSOHU

- Sustainability model - Triple bottom line:
  https://www.youtube.com/watch?v=2f5m-jBf81Q

MODULE 2
MERCHANDISE MANAGEMENT
IN THE BAKERY AND ITS CONTRIBUTION
TO MORE SUSTAINABILITY
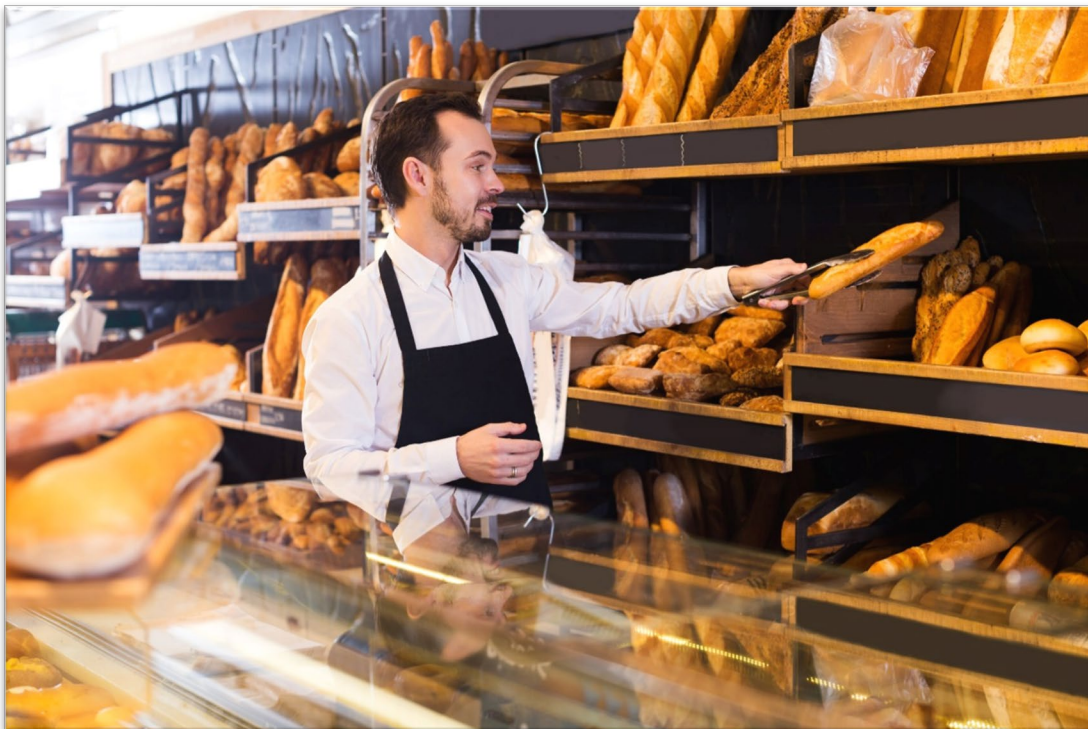
Merchandise management records the flow of goods in a company. It thus represents the basis for the planning processes and flows of goods. In the bakery trade, for example, the purchase of goods or the provision of raw materials for production can be planned. Raw materials for production, as well as processed products that are delivered to the sales stores and returns that could not be sold at the end of the sales day, are documented and managed within the framework of merchandise management. The aim of merchandise management is to establish efficient flows of goods in order to operate as economically as possible.

2. Merchandise management in the bakery and its contribution to more sustainability

2.1 Learning objectives

After completing the module, you can...

- explain the task of merchandise management in a bakery,
- outline what information is exchanged within the bakery business and show how the exchange of information can be improved,
- explain what returns are,
- explain where losses can occur in the individual processes in the bakery,
- calculate and document return rates using the weekly journal,
- identify the reasons for returned bakery products and derive solutions to reduce them,
- show which internal and external influences affect the sales quantities and thus also the order quantities from the sales stores,
- illustrate how merchandise management and sustainability are interrelated,
- demonstrate the importance of the data contained in the weekly journal and the sellout list in order to better match order quantities to actual demand.

2.2 Case study: Merchandise management at "Delicious Daily"

The last customer has just left the bakery "Delicious Daily" and it is closing time. Jason, the bakery salesman, is about to leave for the staff room when his boss Marta asks him if he has counted the returns yet, i.e. the products not sold which will be sent back to the production site. Jason replies that his working hours are now over and he wonders why it is important to write down the returns every day. Zeynep, who is still sorting the last baked goods from the sales shelf into the transport baskets, is also not thrilled that she has to write down the returns: "The numbers don't add up anyway! Today we sent two boxes of baked goods to the store in the neighbouring district because they had too few. In return, the driver brought us a cake from there."

Marta reflects: "Of course, this work also counts as working time and should be done meanwhile. We should put a lot more emphasis on making sure our staff understand why it is important to write all this down - the unsold items and also the goods that are moved between branches! If we enter this information into our management system, it can help us make decisions at many points in the bakery. After all, it's not just about providing these figures for accounting. Analysing returns makes it easier for us in the sales stores to order the right quantities of goods - and that in turn helps the bakers decide how much they need to produce.

Now read the next chapters to find out what merchandise management is all about, what ordering has to do with it and to what extent returns management is an important part of it.

2.3 Controlling the flow of goods with the help of merchandise management

In general, a merchandise management system (MMS) is a model that maps and coordinates the various flows of goods in a company. The complete flow of goods is taken into account here, from the procurement of raw materials to their delivery, warehouse management and the sale of the produced goods. The focus is on the individual articles, which are created in the system for this purpose and are further posted in the event of shifts in the value chain. Thus, the MMS also includes the ordering system within the bakery business - i.e. the recording of the goods that are delivered to the individual sales stores. Returns that are not sold are also recorded. The individual actions are therefore stored and documented so that business decisions can be made in all areas on this basis. These can be, for example, decisions about the quantities of an article to be delivered to the different shops or whether it makes sense to leave articles in the assortment. The aim of merchandise management is to organise the flow of goods efficiently and effectively.

Purchasing	Incoming goods	Warehousing	Outgoing goods	Sale
• Ordering raw materials • Disposition • Complaint	• Receipt of goods • Goods control	• Inventory management • Relocation • Inventory	• Commission • Shipping	• Ordering of sales stores • Returns • Shifting of goods (between stores)

Figure 3: Areas of the merchandise management system (own illustration)

Task 2a: **Flow of goods in bakeries**

What are the flows of goods in your bakery? With which different areas of merchandise management in your company do you have contact? Write the information in the following table and list the information you exchange with the areas. In what form is the information exchanged (e.g. verbally, in writing on paper or by e-mail, digitally via a software system)?

Flow of goods:

_____

_____

_____

_____

_____

The area of merchandise management	Information	Type of information exchange (e-mail, telephone, etc.)	Experience +/-	Opportunities for improvement

Task 2b: Information exchange in bakeries

Discuss in the group why the exchange of information between the different areas of the bakery is necessary. Also discuss your experiences on the form of information exchange - what is already working well and what is not? How could the exchange of information be improved in your company?

2.4 Creating an attractive offer through an optimised ordering system

In the previous chapter you got an overview of the tasks of the merchandise management in a bakery. One of these tasks is ordering. This involves the determination of items that are ordered in sufficient? quantities by the individual shops for daily sales in order to offer customers an attractive and sufficient range of bread and baked goods. The quantities ordered by the shops serve as a basis for production planning. They are therefore an important factor for the efficient use of raw materials. If too large quantities are ordered and not sold, high returns can occur. If too small quantities are ordered, there is a risk that customers will be left with an empty counter and will visit another bakery next time.

Returns that end up in the waste represent food losses. These can be reduced through optimised ordering. Before the following sections describe how order quantities can be better adapted to actual demand, we will first show what other food losses can occur in bakeries and what options are available for reducing them.

2.4.1 Returns and other food losses in the bakery

Task 2c: Food losses in bakeries

Before you read through the following information text on the topic of food losses in the bakery, think about what types of food losses you have already experienced in the bakery. In which area of the bakery, delivery, storage, production or sales, do these losses occur? Write down your thoughts in the following table!

In which area of the bakery do the losses occur?	What is lost?

Food losses can occur along the entire bakery value chain, from production in the central production site or in the bakery shops to commissioning, transport, and finally during the sale in the shops.

Storage losses refer to losses that occur in the context of storage, including, for example, raw materials that have suffered quality losses due to over-storage or incorrect storage and can no longer be used in production. Also **fine flour,** which accumulates in the bakery, is counted as food loss. **Broken bakery products** are those that are no longer sold due to faulty production or other quality defects. This also includes tasters for the customers that have not been touched. Losses also arise in the production when a fixed batch size

for certain bread and bakery products leads to the production of surpluses, or they may originate from cuttings (e.g. ends of bread or box cakes). These baked goods are still edible, but often end up in the waste prematurely.

In addition, **returned bakery products** may also end up as waste. Such returns include bakery goods that have been produced but could not have been sold and are therefore left over after closing time. Such returns include products from the company's own production, unbaked dough, or products for which at least one production step was carried out in the company's own production site (e.g. glazing of donuts). The returns either go back to the production site for further use or are disposed of.

Even in the sales stores where Jason and Zeyneb work, there are occasionally broken goods. For example, Zeyneb remembers that she always has to explain to her new colleagues in sales how the baked goods should be presented and handled. "The other day we had to throw away a lot of pastry with glaze. The glaze was destroyed because the new employee had simply stacked the pastries on top of each other." Jason and Zeyneb also have a lot experience with unsold products. They get? a lot of them every day in their sales store. Or a lot of the daily offered bread remains by the end of the day in their sales store and need to be returned to the production facility.

Marta, their boss, therefore asks herself how these losses and returns can be finally reduced. Jason and Zeyneb would document less at the end of the day and costs could also be saved. Marta also doesn't like the idea that the food ends up as waste, as it would have been still edible and could have benefited some people.

2.4.2 Food losses and returns in the bakery sector

The previous section showed the different types of food losses that occur in bakeries. But it is also interesting to know what the reasons are. From this, solutions can be derived to reduce them and help to act more economically and ecologically.

Food losses can occur in different processes in the bakeries and for different reasons. Take a look at the following list to get an exemplary overview.

Delivery of goods:
- Defective goods, goods of inferior quality, surplus goods due to incorrect order quantities

Storage:
- Incorrect storage (due to e.g. a defective refrigerator)

Production:
- Process losses: contamination during production, start-up and shut-down losses when goods are shifted, litter and punching losses, overproduction resulting from fixed batch sizes
- Quality losses: faulty production (ingredient forgotten, insufficient quality due to e.g. too long/short baking).

Sale:
- Quality losses: short freshness of products in bread and bakery products, incorrect handling of sensitive goods during product presentation (e.g. stacking of bakery products with glaze).
- Surplus goods: customers want goods to be available until closing time, no sales at the end of the day due to incorrect order and production quantities, purchasing behaviour is difficult to assess.

Proportionally, returns cause the largest share of food losses in bakeries.

Task 2d: Food loss prevention strategies

Discuss in the group which food losses you have thought of in task 2c. Think together about how these can be reduced or used further and enter the possibilities in the following table:

In which area of the bakery do the losses occur?	What is lost?	How can the losses be avoided or reduced?
Delivery of goods		
Storage		
Production		
Sale		

Marta, in her role as district manager at several retail stores, sees how many items go unsold at the end of the day. She doesn't like that this food is wasted. On the other hand, she knows the complaints of customers when their favourite roll is already sold out in the evening. Marta knows that there are big differences in the quantity of returned products between the sales stores. She wonders why: "What can some do better than others? Can maybe one shop learn from the other?" She plans to take a closer look at the returns in the coming weeks and then think about suitable reduction measures.

Below are some options that can help reduce returns:

- Limit full shelves until closing time and recommend instead to customers similar type of bakery products that are still available
- Offer baked goods from the previous day at a discounted price
- Reduce pressure on goods (place fewer baked goods of the same type in the display and only refill when needed)
- Implement digital documentation for returned bakery goods (e.g. with the help of intelligent software for process optimisation in the field of merchandise management systems)
- Restructure or reduce the assortment according to A, B and C products (take into account e.g. turnover share and lucrativeness of the products)
- Offer lower prices before closing time – "Happy Hour"

The above examples show that there are various ways to reduce returns. Each bakery has to evaluate what is feasible. A combination of reduction measures may also make sense. However, it is true for all bakeries that adjusting the order quantity to the actual demand of the customers is an efficient way to reduce returns, but the determination of the sufficient quantity can be challenging. How current returns can be evaluated in order to derive optimised order quantities is discussed in the following chapters.

2.4.3 Counting the returns to evaluate them

Marta has told Jason about her plan to compare the returns of the sales stores in her district to see how the returns can be reduced. Jason interjects: "The sales stores in the area are all smaller than us. So it's no wonder that they have fewer returns." Marta agrees. However, she explains to him how these differences in size can be taken into account when evaluating returns.

On the following pages you will learn how to evaluate returns. For this purpose, useful parameters can be calculated, with which, for example, differences in the size of specialist shops can also be taken into account - the return rate and the return value:

Return rate

The return rate describes the ratio of the number of items returned to the quantity delivered. This means that not only the number of items or the weight of the returns are noted, but a percentage value is calculated that shows what proportion of the delivered items was not sold. The return rate can be calculated for different articles or for entire product groups. It provides an overview of what proportion of the articles delivered to the sales store was not sold. Return rates can be calculated in different ways, either in relation to the number of pieces (a), the weight (b) or in relation to their monetary value (c):

a. Number of pieces (pcs)

$$Return\ rate\ in\ \%\ \left(\frac{pcs}{pcs}\right) = \frac{items\ returned}{items\ delivered} * 100\%$$

The number of returns can be recorded manually (see chapter 2.6.1: weekly journal) or digitally, e.g. in the POS system.

b. Weight (kg)

$$Return\ rate\ in\ \%\ \left(\frac{kg}{kg}\right) = \frac{weight\ of\ items\ returned\ (kg)}{weight\ of\ items\ delivered\ (kg)} * 100\%$$

To calculate the weight share, the weights of the returned products must be known. If this is not the case, the goods must be weighed in order to determine the weight-related return rate.

c. Monetary

The return value indicates how much money the bakery loses through unsold items. This can be calculated as follows:

$$Return\ value\ in\ EUR$$
$$= Unit\ prices\ of\ returned\ items\ (EUR) * items\ returned\ (pcs)$$

$$Return\ rate\ in\ \%\ \left(\frac{EUR}{EUR}\right) = \frac{Return\ value\ (EUR)}{Sales\ value\ (EUR)} * 100\%$$

The return value is calculated by multiplying the unit price (net sales price per item) of a specific item and the number of returned items of the

respective product. The sales value can be determined by multiplying the number of items delivered and the respective unit price. Unit prices can be taken from merchandise management or cash register systems.

The total return value is the sum of all individual return values.

$$Total - Return\ value\ in\ EUR$$
$$= Sum\ of\ return\ values\ of\ all\ returned\ items\ in\ EUR$$

The calculation of the return rate based on the number of pieces (a.) as well as based the return value (c.) is often used in the so-called weekly journal. More on this in the following sections.

Task 2e: Return rates

Calculate the return rate and total return value for the items in the table below. First look at the calculation example for rye buns:

Return rate (rye rolls) = 20 / 100 *100% = 20%.
Return value (rye rolls) = 20 pieces * 0.70 EUR/piece = 14 EUR

Article	Net sales price (in EUR)	Delivery quantity (in pcs)/return quantity (in pcs)	Return rate	Return value
Rye roll	0.70	100 / 20	20%	14 EUR
Multigrain rolls	0.80	120 / 10		
Chocolate roll	0.90	50 / 20		
			Total return value:	

Marta has calculated the return rates of different bakery products for the sales stores she manages. She finds that there are significant differences between them. She takes it upon herself to sensitise the employees in the shops with the high returns to the issue. She thinks about how she can communicate to them how returns and sustainability are connected.

2.5 Connection between returned bakery goods and sustainability

The way bakeries deal with returns varies depending on national practices and regulations. In general, returned bakery products can go different pathways. While some unsold bread is passed on to charities, the other is processed to animal feed or recycled to compost. Also bakery goods might end up in the ordinary waste bin (especially when its mingled with packaging material and there is no time and efforts for separation). Then it ends up at waste incineration plants or is even landfilled, which causes economic losses and above all contributes to a waste of resources. For example, the cultivation or harvesting of raw materials in agriculture requires energy or water. Resources are also needed for the production or storage and transport of breads and baked goods, which are wasted when items are ultimately not sold.
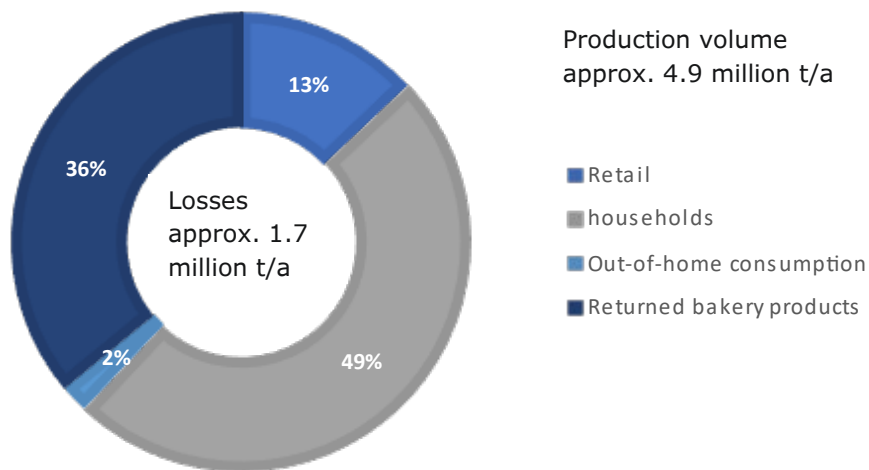

Figure 4: Production of baked goods and baked goods losses in Germany in 2015 (Source: own illustration based on Schmidt et. al. 2019)

Let's take a look at Germany as an example: In Germany, about 4.9 million tonnes of baked goods were produced per year in 2015. Of this, a total of 1.7 million tonnes ended up as waste - this corresponds to approximately 34 per

cent, i.e. one third of the quantity produced. Figure 4 shows in which area of the value chain what proportion of baked goods is lost. The first area to be mentioned here is private households. This is where most baked goods end up in the bin. At 49 percent, they cause almost half of the losses. In second place are the bakeries themselves: Returned (unsold) bakery products from bakeries also make a significant contribution (36%) to the losses in Germany - a total of 612,000 tonnes per year. Losses in retail and out-of-home consumption, on the other hand, are only 13 and 2 per cent respectively.

Task 2f: Returns and sustainability

Remember the first module on sustainability. There you learned about the sustainability triangle. What impact do returns have on the three dimensions of sustainability: environmental, social and economic? Name two aspects each and insert them into the diagram.

ENVIRONMENT

ECONOMY

SOCIETY
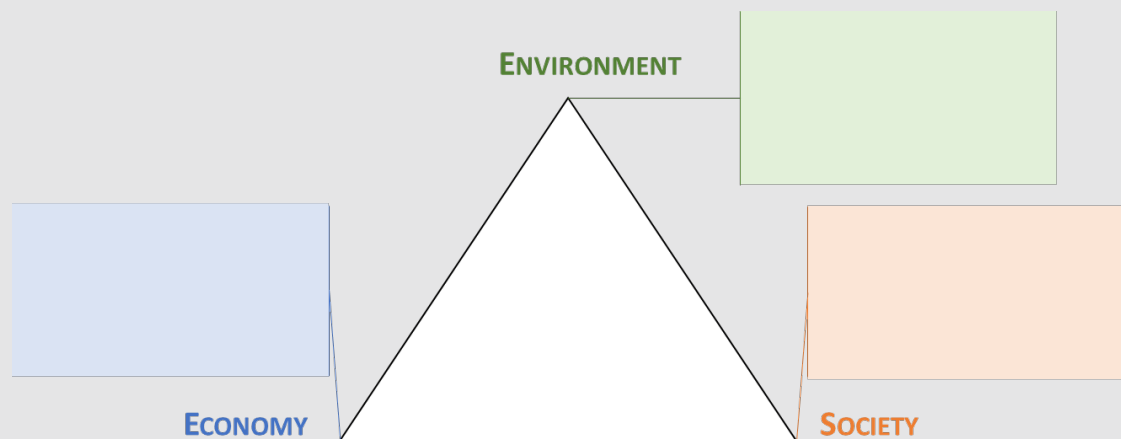
2.6 Documentation and evaluation of returned bakery goods

Marta has motivated her sales staff. Jointly they want to reduce returns. They all make every effort to document the returns correctly. Marta finds that she receives very different documents from the various stores on which the returns are noted. For example, from some stores she receives the delivery bills on which the returns are noted, while others use the weekly journal provided by the management. Marta recognizes that there are often lower return rates in these stores. The weekly journal seems to be helpful in better matching order quantities to actual needs. During her subsequent visits to the various stores, she explains to the sales staff how they can best document the returns and why this is useful.

In order to get an overview of the amount of returns, it is useful to know which products are really selling well and should therefore be kept, and which products are less in demand by customers and could therefore be produced less. Analyses prepared by the sales staff in the shops can help here: the weekly journal and the sellout list. The function and use of the two tools are presented below.

2.6.1 Tool for documenting returns - the weekly journal

The weekly journal shows the order and return quantities of the last sales week as an overall presentation. The weekly journal fulfils several tasks at the same time:

- it maps the past sales week with the daily order and return quantities at item level,
- it makes the return rate and the return value visible and
- it allows a quick check for booking errors.

Structure of a weekly journal:

In addition to the item number and the item description, the delivery item quantity and also the number of returned items are taken into account for each day of the week and added up for the week at item level. By specifying the sales value, the return value can be determined in the same way as the return rate (see chapter 2.4.3).

Table 1: Example of a weekly journal (own illustration)

Art no	Article	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Sales value €	Ret value €	Return %
2745	Yeast bread	8/2	8/2	4/2	6/1	12/2	17/1	65/10	120.25	18.50	15.38
2754	Rg.mixed bread	10/1	10/5	6/0	8/1	16/2	20/2	70/11	143.5.0	22.55	15.71
2756	Multigrain bread	6/3	4/2	4/3	4/1	10/2	12/2	40/13	98.00	31.85	32.50
2757	Brioche	8/2	6/2	3/0	6/3	8/0	12/0	43/7	101.05	16.45	16.28
2758	Baguette	2/2			1/0	4/1	8/1	15/4	24.75	6.60	26.67
3501	Sultana snc	30/2	3/6	20/2	30/8	40/6	40/2	190/26	218.5	29.90	13.68
3502	Nut loop	20/9	20/12	10/4	10/2	25/6	30/6	115/39	132.25	44.85	33.91
4001	Dough rolls	500/67	500/59	400/32	600/43	700/39	800/41	3500/281	875.00	70.25	8.03
4002	Dough rolls whole wh.	45/17	45/22	30/7	45/8	60/12	75/15	300/81	165.00	44.55	27.00
									1878.30	**285.50**	**15.20**

Remember:
The return rate in % is calculated:

$$= \frac{Return\ value\ (EUR)}{Sales\ value\ (EUR)} * 100\%$$

Sorting is usually done according to article numbers (product groups) to enable a quick evaluation. The daily displays are supported by informative summaries, such as sales value, returns value and percentage of returns.

The term "returns", which appears again and again in the following, refers either to individual bakery products or, in the overall presentation, to pure baked goods. This means that no merchandise such as beverages or magazines are included in the overall evaluation. In order to achieve the greatest possible benefit, the business needs to be organised in such a way that the weekly journal is updated on a daily basis. This means, the sales staff documents the returns daily and provides this information to the management. This may happen either by handing over the actual paper document or by providing the data online. The management then gives feedback to the sales staff on the following day about the calculated return rates, so that the current orders can be placed on this basis. This is done daily in the weekly journal so that at the end of each week the journal provides a summary of the order and sales quantities for each article.

In addition, other flows of goods such as the transfer of goods between the individual branches should also be documented. If an exchange of produced articles takes place between the branches, this must be documented in detail both by the employees in the branch shops and by the office team so that there are no sources of error in the documentation of the data.

Task 2g: Factors influencing sales

It is summer and the Delicious Daily bakery is busy. The bakery is known for the best cakes in town, but at this time a lot of cream cakes are not sold.

The staff is puzzled and thinks about how this problem can be explained. What could be the reasons for the low sale?

Reasons:

_____

_____

_____

_____

_____

You have now learned about the weekly journal. Consider in the group what other factors could have an influence on sales figures?

Note: Are there any events during the year or day that could lead to less/more products being sold?

Reasons:

_____

_____

_____

_____

2.6.2 Supplement to the weekly journal - the sellout list

The sellout list is a supplement to the weekly journal and serves to determine an optimal order quantity. The sellout list is updated daily in the sales stores, i.e. whenever a regular article is sold out, the respective time of the last sale must be documented. In order to be able to make successful decisions based on this information, the management, the district management as well as the branch managers have to deal with the figures regularly and intensively. The evaluation is done with the weekly journal and helps to derive the optimal order quantity. If an item was sold out early, a larger number could probably have been sold in addition during the course of the day. If, on the other hand, an item was nearly sold out until the end of opening time, the quantity ordered corresponds fairly closely to the actual demand. Each item must be considered separately, because whether an item can still be sold at a later time depends, of course, on what kind of product it is. In order to minimise returns and to be able to fulfil the customers' wishes until the end of the opening hours, it is therefore important to determine the optimal delivery quantity of each item. The evaluation of the sellout list is carried out together with the weekly journal.

Important information for evaluating the sellout list is:
- Holidays
- Weather
- Temperature
- Special events such as football matches
- external influencing factors such as construction sites, closure of other bakeries, supermarkets, etc.
- Special advance orders from customers
- Customer behaviour during certain special promotions

These influencing factors can be added as additional columns in the weekly journal. It is important here that an **evaluation of the influencing factors is** always carried out in order to ultimately analyse when the products sell well or poorly. This helps to better estimate customer wishes and thus order quantities. The evaluation can be done, for example, using minus and plus signs.

Notes on the weather:

Characters	Description
-	Heavily cloudy, mainly dry
--	Heavily cloudy, rain/ variable
---	Continuous rain, snowfall, stormy
+	Variable cloudiness, dry
++	Slightly cloudy, beautiful
+++	Beautiful, very warm/humid Beautiful, very cold/freezing

On the following page you will find a template for a weekly journal in which the sellout list is integrated and comments on special events can be entered. The weather conditions for each day are indicated on the bottom line and special events are entered directly below the sellout time. In this example, on customer purchased an unusual large amount of bagels, which is indicated by the note "bulk purchase".

Table 2: Template of a weekly journal with integrated sellout list (own illustration)

Art no	Designation	Monday	Time of sale / Note	Tuesday	Time of sale / Note	Wednesday	Time of sale / Notes	Thursday	Time of sale / Notes	Friday	Time of sale / Notes	Saturday	Time of sale / Notes	Total	Sales value €	Return value €	Return %
2757	Rye bread	8/2		6/2		3/0	15:30	6/3		8/0	17:00	12/0	16:30	43/7	101.05	16.45	16.3
2869	Bagel	20/0	18:00	25/0	15:00 Bulk purchase	15/1		20/8		25/1		30/0	17:00	135/4	128.25	9.50	7.4
		++		+		++		---		++		+++					

Marta is now asking herself what an economically justifiable return rate is and how she can use the information from the weekly journal and the sellout list to order quantities that are more in line with actual demand in the future.

2.7 Determining the ideal return rate

Is there an ideal rate of returned bakery goods? No, there is no such thing as an ideal rate of goods returned! Every bakery is different, depending on the assortment and other influencing factors. But there is a margin where the business makes the least possible economic losses, but the customers are at the same time still satisfied. In addition to the amount of returns that result for each item, it is also necessary to consider how much each item contributes to covering the bakery's costs, i.e. how profitable an item is. A tool that takes this into account is the ABC analysis. You can find more information on this in the links at the end of this chapter.

Return control plays an important role in optimising the returns process and thus minimising return rates. The subdivision should take place on the basis of the different product groups, as these show clear differences in terms of their lucrativeness. The ordering process can thus be better assessed and optimised for individual product groups without changing the ordering behaviour for the entire assortment. The determination of the return rate has a direct influence on the ordering behaviour and the achievable merchandise pressure on the shelves and counters (merchandise presentation). With a calculated low return rate, sales gaps in the shelves and counters can become apparent much earlier than with a high calculated return rate. However, the aim must be to present the customer with an appealing presentation even at a late hour without exceeding the specified return rates.

Marta has now familiarised the sales staff in her district with the extended weekly journal and the sellout list. But in day-to-day business, time is short and manual entry can take a lot of time. It would be best if there was a solution for this, which ensures that all the data is easily analysed. It is especially important to Marta that the right quantities are ordered and that the customers' purchasing behaviour is taken into account. This should result in an optimised return rate. Perhaps there are digital software solutions that could help here?

To learn how you can get away from paper work and use digitalised tools, here is "Module 3 - Digitalisation in the bakery trade".

2.8 More information

Take a look here:

- Retoure als täglich Brot (Returns as daily bread) (in German):
  https://www.focus.de/gesundheit/ernaehrung/geniessen/ernaehrung-retoure-als-taeglich-brot-so-viele-backwaren-landen-im-muell_id_4484592.html

- WWF study "Unser täglich Brot" (Our Daily Bread) - Among other things, you can learn how returns can still be reused (in German):
  https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-Studie-Unser-taeglich-Brot_Von-ueberschuessigen-Brotkanten-und-wachsenden-Brotbergen_102018.pdf

- Returns in the bakery (Video in German):
  https://www.youtube.com/watch?v=cpA83TGsbQI

- Transferleitfaden – Künstliche Intelligenz für den Handwerksbäcker
  https://handwerk2025.de/wp-content/uploads/h2025-digi-werkstatt_ki-baecker-transferleitfaden-1.pdf

- ABC-Analysis - Easily explained:
  https://www.youtube.com/watch?v=tzosTe2UOvs

MODULE 3: DIGITALISATION
IN THE BAKERY TRADE

Digitalisation is an integral part of today's society and is increasingly influencing the world of work. Traditional industries such as the bakery trade can also benefit from data collection and good data quality. This can help to maintain and strengthen the ability to react and thus the competitiveness in the dynamic market environment.

3. Digitalisation in the bakery trade

3.1 Learning objectives

After completing the module, you can...

- describe the opportunities that arise from the introduction of software in the digitalisation of processes in bakeries and the challenges that can approach to facilitate software implementation in bakeries,

- explain how digitalisation in the bakery trade influences the individual dimensions of sustainability,

- present the advantages of intelligent software for order optimization (forecasting software) in bakeries.

3.2 Case study: Order optimisation at Delicious Daily

The 15 sales stores of the "Delicious Daily" bakery have a wide range of breads and baked goods. To order the right quantity, Marta, the boss, gets weekly feedback from the stores on individual items by phone and then estimates the quantities to be ordered from the central production site- this requires a lot of consultation and time. Zeyneb, a bakery salesperson, tells her boss that it happens from time to time in her store that the number of bakery products is either too short or that too many baked goods are returned. For Marta it is clear that in both cases the business is making losses. This is a difficult problem to solve - after all, on the one hand, it is important to have a sufficient supply for customers, and on the other hand, the excess baked goods end up uneaten in the waste.

Marta is worried:

How can the problem be solved in the long term? Aren't there perhaps digital tools that simplify the ordering of bread and bakery products? Zeyneb is also thinking about how the information about the products needed can get to Marta in a more uncomplicated way.

Read through the following chapters to find out how the case study relates to the topic of digitalisation and sustainability.

3.3 Digitalisation in the bakery trade

Traditional businesses like bakeries have managed for decades without much digital technology. After all, the production of baked goods is based on craftsmanship. However, the challenges in everyday life and in the future are making the bakery's daily routine more and more complex. Absenteeism due to illness, rising energy prices, raw material and personnel costs, as well as ongoing competition are leading to enormous competitive pressure. It is becoming more and more difficult to operate profitably.

Digitalisation can help here. After all, various data can be analysed with the help of digital software and provide assistance with difficult decisions. For example, software can help to optimise order quantities in the long term and thus reduce food waste and costs (more on this in chapter 3.4). Or the planning of staff shifts or goods deliveries can be simplified by digital applications.

Oh great!
The weekly journals from Module 2 could thus be kept digitally and evaluated by software!

Marta realises that paperwork can be reduced through digital software. In addition, the operational data can be stored continuously and also retrieved at a later point in time. This means that an overview of operational activities is always maintained.

Every bakery is individual. Whether and to what extent software can help to make the business more sustainable depends on many factors. Within the stages of the bakery value chain - from the ordering of goods to the sale of processed products and the overall management and controlling - there are various types of software that can be used.

> **Software** is a programme that can be installed on a digital end device (PC, laptop, mobile phone, tablet) and used with or without internet access.

Task 3a: Digitalisation in your own business

Does your company already work digitally? If yes, in which areas is software used and what is its name?

Discuss this with the other participants in the group.

3.3.1 Opportunities and challenges in digitalisation

Digitalisation offers further opportunities in addition to the simplification of processes. But of course, it is not always easy to integrate new software into a business. After all, the first question is in which area a software should be used - and then the decision for and against different offers on the market has to be made.

Table 3 below shows general opportunities and challenges that can arise in the digitalisation of processes in bakeries.

Table 3: Opportunities and challenges in the introduction of software in the bakery trade (own elaboration)

Opportunities	Challenges

Costs:
• Reduction of costs, through e.g.
  ○ improved use of human resources
  ○ reduction of the returns rate
  ○ optimised production and storage
  ○ optimised order quantities
 	
Data collection and evaluation:
• Easier collection and archiving of operationally relevant data and permanent insight / review
• Clear and continuous presentation of operating activities and economic key figures
 	
Processes and workload:
• Optimisation of processes, through
  ○ Better decisions on e.g. ordering goods, deployment and staff planning
• Reduction of time spent compared to paper management
 	
Staff:
• Further training of staff with regard to an increasingly digitalised working environment
 	
Operating activities:
• Gaining a competitive advantage
• Improved adaptability in a dynamic competitive environment through data collection and evaluation
	Costs
	• Initial and ongoing costs for the use of the software
	
	Implementation
	• Time-consuming selection of suitable software for the operation
	• Inadequate suitability of the interfaces between the software and the computer/operating system or the cash register and merchandise management system.
	
	Data quality:
	• Digital data may not be available if everything was analogue before.
	• Low data quality, due to partly digitalised processes or e.g. incorrect entries in the cash register and merchandise management system.
	
	Processes and workload:
	• Initial high workload for the introduction of the software
	• Changes to existing processes
	• Introduction of new process flows
	
	Staff:
	• Excessive demands due to e.g. little experience in dealing with software
	• Lack of trust in software and digitalisation
	• Resistance in the workforce to digitalisation
	• Resistance to change due to the introduction of new processes or changes to existing processes
	• Insufficient capacities for project management

Task 3b: Opportunities and challenges of digitalisation in your own business

What opportunities do you see for the introduction of **ordering software to optimise order quantities (forecasting software)** in your bakery? Do you also see challenges? Enter your thoughts in the following table:

Opportunities	Challenges

What solutions can you think of to overcome the challenges in your company? Discuss the results in the group.

_____

_____

_____

_____

_____

_____

_____

In the bakery "Delicious Daily" there are also reservations among the staff about the use of digital applications. Some employees feel overwhelmed, while others are afraid that their jobs could be at risk. Marta is now asking herself how the challenges in the bakery can be overcome. Because that way the advantages would outweigh the disadvantages. Of course, this requires some time and personnel capacities, but she is nevertheless very interested in taking this step. After all, everything is becoming more digital and she wants Delicious Daily to keep up with the times.

3.3.2 Approaches to meet the challenges of software use

Just as the challenges of selecting, implementing and using software can vary from company to company, there is no one solution to eliminate the challenges. Nevertheless, general guidelines can be derived to facilitate the use of software.

Zeyneb is also aware that only the company as a whole can make a difference. She likes to work with digital applications, but knows that some of her colleagues do not. It is important for her to have an exchange with her boss, because she has some ideas on how to convince her colleagues and take away their fears. She would like to share her views on the challenges of introducing the software in order to find solutions together.

The following guidance in Table 4 can help to address potential challenges with more certainty and support decision-makers:

Table 4: Assistance for overcoming challenges in the introduction of software in bakeries (own elaboration)

Costs	• **Cost calculation** for investment and continued use and weighing against **savings potential** through optimisation of processes • Look for **funding programmes** from the federal government within the framework of digitisation or other funding organisations.
Implement ation and Use	• **Exchange with** various software providers > If available, use **demo versions of** the software to see whether the functions are sufficient for the planned use and whether the handling is understandable. • **Exchange with colleagues from the industry** on experiences with software in the desired field of application • Allow **time for implementation and familiarisation**
Data quality	• **Preparation of** existing data and sustainable maintenance of data entry • Identify and correct **sources of error in** data entry (e.g. an incorrect key configuration in the digital cash register or incorrect entries). • Create **backup copies of** data continuously
Processes and workload	• Be open to process changes • **Clarify** process **changes with the team** • Determine **time required for** implementation and use before software roll-out • Clarify **responsibility for** the use of the software: When should who use the software? Or Who should use and when to use the software?
Staff	• Obtain **feedback** from staff on e.g. excessive demands but also on challenges in the daily work routine • Make use of **training offers** from the software provider on how to use the software • **Train** employees in general on the topic of **digitalisation and raise their awareness of its use.**

3.4 Intelligent software for order optimisation

In the bakery trade, intelligent software in the ordering system can help to simplify the ordering process and optimise order quantities in the long term. It is also referred to as forecasting software. Such an intelligent software is defined by the fact that very different data are systematically evaluated for a specific application.

In the case of **intelligent software for order quantity optimisation,** data from the merchandise management and cash register system is automatically analysed. Order and sales figures from the past as well as daily updated data are taken into account in this evaluation. In addition, it looks at what else could have influenced the sales figures - was it perhaps a particularly hot or rainy day or was there a construction site in front of the shop (see Module 2 - Merchandise Management). Because many events influence the sales figures.

Remember Module 2 on merchandise management: There were several influencing factors that have an impact on the purchasing behaviour of the customers and thus on the order quantities.

The great advantage of intelligent software for order quantity optimisation is that it automatically includes various occurrences (such as the weather) or recurring events (such as the day of the week or holidays) in the data analysis. The software then derives a suitable order suggestion from this and thus provides a forecast for the shopping behaviour of customers under certain conditions. The suggested order proposal can be accepted directly or modified if necessary. In this way, the final decision is still made in one's own mind.

Marta is thrilled - up to now, she has always tried to predict the customers' shopping behaviour herself and include it in the ordering process. Her many years of experience made it easier for her to estimate the order quantities for holidays such as Christmas, but she always had to fall back on her memories. Marta is positively impressed that such intelligent software applications exist for the bakery trade. After all, it would hardly be possible for the human brain to take all these influencing factors into account at the same time!

Task 3c: Intelligent software for optimising order quantities in your own company

1. Imagine that you have to convince your boss of the advantages of a forecasting software. First, write down your own arguments for the acquisition of such software.

_____
_____
_____

2. In a group, share the arguments you have found. Within the group, also consider how the use of such software would best affect the costs in the bakery and the achievable turnover. Write down your thoughts in the table below and think about how you can use the arguments to convince your superiors.

Impact on costs

_____

_____

_____

Effects on turnover

_____

_____

_____

Why should I use such software and what is sustainable about it?

In the best case, optimised orders lead to a reduction in returned bakery products. This can save costs and avoid waste. Customer satisfaction is maintained because the software can evaluate which items are particularly popular and in what quantity they should be ordered. Thus, a business benefits in all three dimensions of sustainability and can react agilely to the dynamic market environment at the same time. In addition, more and more customers are interested in sustainably produced food and want more transparency from companies regarding their business practices. With the help of intelligent software and the available data on, for example, return

rates, bakeries could actively advertise their commitment to combating food waste! As already illustrated in Module 1, every operational decision also has an impact on the dimensions of sustainability, which are shown in Figure 5 below:

Figure 5: Impact of forecasting software for bakeries on the dimensions of sustainability (own illustration)
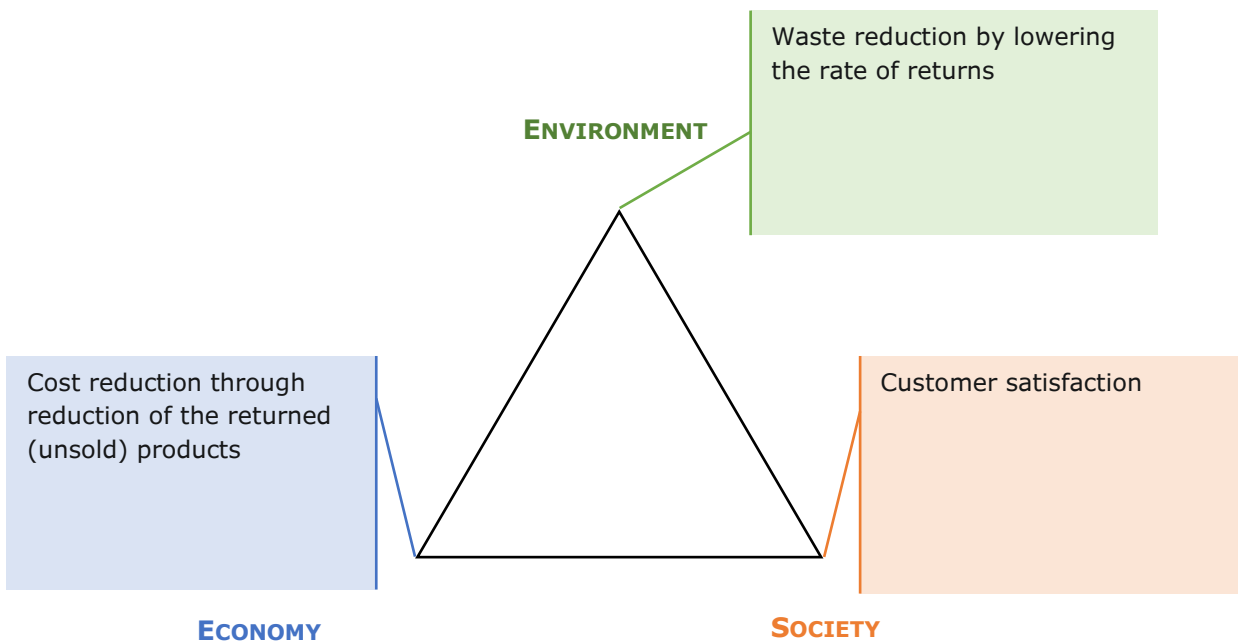
Task 3d:

The effects of forecasting software on the three dimensions listed in Figure 5 are positive.

1. Consider whether you know of any other positive effects.

2. Are there also negative effects?

Add the positive and negative aspects in the figure above. *Mark the positive and negative effects with a plus (+) and minus (-) respectively.*

What intelligent software applications for order quantity optimisation (forecasting software) are currently available?

The following table provides an overview of currently available intelligent software applications for order optimisation in the bakery trade. Please regard that this list does not claim to be exhaustive. A prerequisite for the successful introduction and use of such software is **data from a digital cash register and merchandise management system**.

Table 5:Examples of intelligent software for order quantity optimisation (own illustration based on BWHM (o.J.) p. 13)

Name of the programme and provider	Link to the website	Further services	Language
BackPlan Backdigital GmbH	https://backdigital.de/backplan/	BackPersonal with order quantity optimisation, webshop, digital consulting and online marketing	German
BakerAI Planner AI GmBH	https://baeckerai.de/	Order quantity optimisation and sales forecasts, Analysis dashboard, contribution margin accounting	German
Cybake Cybake PTY Ltd	https://cybake.com/bakery-software/integrate/epos/	Order quantity optimisation, production planning, merchandise management, route optimisation	English
Delicious Data Delicious Data GmbH	https://www.delicious-data.com/	Order quantity optimisation, sales forecasts and intelligent daily planner, analysis dashboard, food waste monitoring	German English
Food21 Food21 UG	https://www.food21.de/	Order quantity optimisation, forecast and trends, Sustainability seal	German
FoodTracks Antegon GmbH	https://www.foodtracks.de/	Order quantity optimisation, branch tuning, branch radar, order tuning	German
Intab Pro Intab Pro GbR	https://www.intab.pro/	Order quantity optimisation, process optimisation	German
Meteolyx meteolytix GmbH	https://meteolytix.de/	Order quantity optimisation, turnover planning, personnel planning, production control, purchasing planning, controlling	German
OPAL OPAL-Operational Analytics GmbH	https://www.operational-analytics.de/	OPAL forecast tool for order quantity optimisation, back planner, order application, key figures	German
BBN Forecast	https://www.ok-gmbh.com/de/loesungen/bbn-software	Order quantity optimisation, merchandise management, digital cash register system, personnel planning	German
Forecast Justus Lauten GmbH	https://foodforecast.com/	Order quantity optimisation, sales planning via digital terminal, contribution margin accounting	German

3.5 Practical example - Kraus Bakery

The Kraus bakery decided to use a forecasting software to optimise order quantities in a total of twelve branches. Read the following practical example to find out how this has affected operational performance:

The Kraus bakery in Germany has introduced the intelligent software for order quantity optimisation called FoodTracks in its total of 12 branches. With the help of this software, the bakery has changed its ordering system from a decentralised ordering process to a centralised ordering process. Through this change and the use of FoodTracks, Kraus Bakery was able to optimise its processes. Ordering decisions were easier to make because the software calculated optimised order quantities for the individual branches. With the help of the software-supported data evaluation, the Kraus bakery can now respond much more flexibly and without doubt to the needs of the customers and the factors influencing the daily business - the conversion of the ordering system and the preparation of the data, which initially seemed costly, has paid off! Because: In addition to a lower rate of returns, the bakery has recovered the investment costs and also achieved an increase in turnover of 3000 - 4000 € per branch per month.

The complete success story can be found at the following link:
https://www.foodtracks.de/erfolgsstorys/baeckerei-kraus/
(in German)

🔍 3.6 More information

Take a look here:

- Sustainable digitalisation:
  https://www.digitalsme.eu/what-is-sustainable-digitalisation/

  Video (in German)
  https://www.youtube.com/watch?v=-C46WNVWtW8

- Funding opportunities for digitalisation for SMEs (in German)
  Fördermöglichkeiten zur Digitalisierung für den Mittelstand: BMWK
  (2022): „Digital Jetzt"– Neue Förderung für die Digitalisierung des
  Mittelstands
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Module 3: Digitalisation in the bakery trade

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Annex 2: Workshop concept

The views and opinions expressed in this document are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

WORKSHOP CONCEPT

"Reducing returned bakery products and promoting sustainability – preparing bakery staff for the use of digital forecasting tools"

This document is the planning concept for the workshop "Reducing returned bakery products and promoting sustainability – preparing bakery staff for the use of digital forecasting tools ". This concept contains suggestions for the time schedule and the applicable methods.

The target group of the workshop comprises all employees in bakeries who have to work directly with forecasting software for order optimization or who contribute to providing the necessary data (such as data on sales or returned goods). This group includes employees from strategic as well as operative positions, such as sales staff.

The workshop prepares potential users for the application of artificial intelligence-based forecasting software. It can be used as a measure of further education, it can be integrated into the vocational training for bakery staff, or it can be applied in vocational education and training measures for sustainable development of the bakery sector. Forecasting software providers can also use it to train their potential users.

The workshop is planned as a full-day course. Although the workbook also provides enough content and assignments to extend the course to 1.5 days The concrete planning (time and methodology) depends on the composition of the group (e.g. composition, age, function in the bakery) and the time and infrastructure available.

The thematic units covered during the seminar are divided into three modules:

- Module 1: Sustainability in bakeries

- Module 2: Merchandise management in the bakery and its contribution to more sustainability

- Module 3: Digitalisation in the bakery trade

The seminar was developed as part of the European research project LOWINFOOD, which is funded by the Horizon 2020 programme (duration 11/2020 - 02/2025, funding code 101000439, www.lowinfood.eu). The aim of the LOWINFOOD project is to reduce food losses and waste along the value chain in bread and bakery products, fruit and vegetables and fish, as well as in the consumption of food in the out-of-home catering sector and in private households. Researchers, businesses and other relevant stakeholders are working together on this project. They are testing innovative approaches to reduce waste in the European food system and assessing their impact on sustainability. This concept was developed in cooperation with the three project partners - Akademie Deutsches Bäckerhandwerk Nord gGmbH, FoodTracks Antegon GmbH and the Institute of Sustainable Nutrition at Münster University of Applied Sciences.

Table 1: Concept for the design of the seminar " Reducing returned bakery products and promoting sustainability – preparing bakery staff for the use of digital forecasting tools".

Time	Du-ration	Module	Unit	Learning objectives: Participants will be able to…	Method
08:30-09:00	30'		Welcome		e.g. speed dating
09:00-10:15	75'	Module 1	Introduction to sustainability	explain what the terms sustainability and sustainable development mean explain what the Sustainable Development Goals (SDGs) and the dimensions of sustainability are highlight the impact of entrepreneurial action in bakeries on the three dimensions of sustainability (ecology, economy and social)	e.g. Frontal, Brainstorming/-writing, Group work, Expert panels afterwards, summarise the results on a joint memo board.
10:15-11:30	75'		Superfood / regional sourcing	compare the advantages and disadvantages of regional and global raw materials and supply chains.	
11:30-12:30	60'	Module 2	Introduction to merchandise management	explain the task of merchandise management in a bakery business outline what information is exchanged within the bakery business and show how the exchange of information can be improved.	
12:30-13:00	30'	**Lunch break**			

Time	Duration	Module	Topic	Learning objectives	Methods
13:00-15:00	120'	Module 2	Returns	explain what returns are and where losses can occur in the individual processes in the bakery.	e.g. Frontal, Brainstorming/-writing, Group work, Expert panels
				calculate and document return rates with the help of the weekly journal.	
				identify the reasons for returns and derive solutions to reduce them	afterwards, summarise the results on a joint memo board.
			Returns and sustainability	demonstrate how enterprise resource planning and sustainability are interrelated.	
			Weekly journal, sales list - Tools for taking returns into account when making ordering decisions	reflect which internal and external influences affect the sales quantities and thus also the order quantities and show how these affect the sales quantities	
				demonstrate the importance of the data contained in the weekly journal and the sales list in order to better match order quantities to actual demand.	
15:00-15:15	**15'**	**Coffee break**			
15:15-16:30	75'	Module 3	Opportunities and challenges of digitalisation in the bakery trade	list which opportunities arise from the introduction of software in the digitalisation of processes in bakeries and which challenges can arise.	e.g. Frontal, Brainstorming/-writing, Group work, Expert panels
				derive solution options to facilitate software implementation in bakeries.	
			Order quantity optimisation by means of forecasting software	present the advantages of intelligent software for order optimisation in bakeries.	afterwards, summarise the results on a joint memo board.
			Forecasting software and sustainability	explain how digitalisation in the bakery trade influences the individual dimensions of sustainability	
16:30-17:00	30'		Conclusion / Feedback		e.g. traffic light approach