ICCEE

Improving Cold Chain Energy Efficiency
in food and beverage sector

ICCEE tools and examples on supply chains in the food and beverage sector

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Improving Cold Chain Energy Efficiency in food and beverage sector

The ICCEE Project

ICCEE project focuses on SMEs in cold supply chains (CSC) of the food and beverage sector, being CSC the **most energy-intensive systems** and at the same time with limited understanding of its **large potential for energy efficiency, improving product quality and environmental indicators**.

Facilitation

The ICCEE project will facilitate the food and beverage sector cold chains to undertake energy efficiency measures after carruing out **supply chain energy assessments/audits**. Why **focus on the cold chains** of the sector? Because of its significant stages (refrigerated transport, processing and storage) **with large energy saving potential**

Implementation

The project follows a **holistic approach**, shifting from a single company perspective to the chain assessment, which will lead to increased opportunities to **improve the product overall energy efficiency, quality and environmental indicators**

Accelerate Investments

Through expert **analytical tools** and **other resource**, the project will accelerate turning energy efficiency opportunities into actual investments, with a special focus on supply chains involving European small and medium sized enterprises (SEMs).

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ICCEE-Toolbox: Support at 360 degrees

Tool #0: Guidance
Do you want to know more about solutions and funding for energy-efficient CSCs?

Tool #6: Multi-criteria analysis tool (MCDA)
Did you already take a look at the CSC and LCA tools and do you want to know more?

Tool #1: Cold supply chain tool (CSC)
Do you want to analyze your CSC's energy consumption and prevent food quality losses?

Tool #5: Non-energy benefit evaluator (NEB)
Do you wonder how to analyze non-energy benefits in a structured manner?

Tool #2: Life cycle assessment tool (LCA)
Do you want to understand the environmental impact of your CSC?

Tool #4: Benchmarking non-energy benefits (BEN)
Are you interested in other factors relevant for decision making on CSC energy performance?

Tool #3: Life cycle costing tool (LCC)
Do you wonder about the economic benefit from energy efficiency measures?

Find all the Tools, instructions and videos on how to use them at: https://iccee.eu/the-iccee-tool-2/

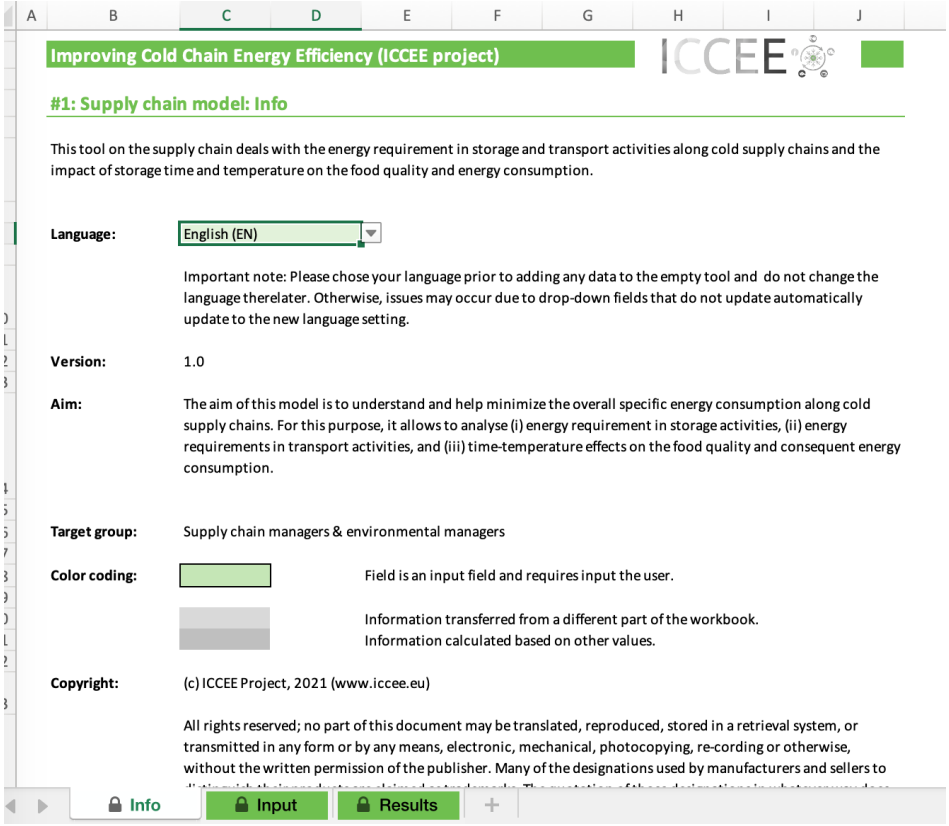
ICCEE-Toolbox application examples

Some examples of the results of the use of the **Tool #1 Cold supply chain tool (CSC)** for specific chains are shown in the next pages.

The Tool #1 aims to analyze the CSC's energy consumption and prevent food quality losses.

It was used to analyze the 4 reference sectors of the project:

- Fish
- Fruit&Vegetables
- Meat
- Dairy



Improving Cold Chain Energy Efficiency (ICCEE project)

#1: Supply chain model: Info

This tool on the supply chain deals with the energy requirement in storage and transport activities along cold supply chains and the impact of storage time and temperature on the food quality and energy consumption.

Language: English (EN)

Important note: Please chose your language prior to adding any data to the empty tool and do not change the language therelater. Otherwise, issues may occur due to drop-down fields that do not update automatically update to the new language setting.

Version: 1.0

Aim: The aim of this model is to understand and help minimize the overall specific energy consumption along cold supply chains. For this purpose, it allows to analyse (i) energy requirement in storage activities, (ii) energy requirements in transport activities, and (iii) time-temperature effects on the food quality and consequent energy consumption.

Target group: Supply chain managers & environmental managers

Color coding: Field is an input field and requires input the user.

Information transferred from a different part of the workbook.
Information calculated based on other values.

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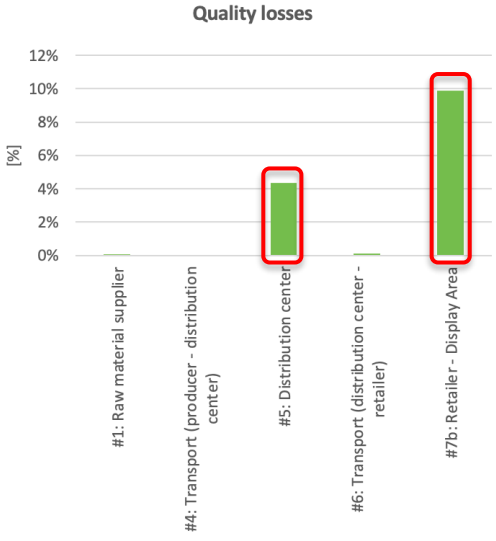
All rights reserved; no part of this document may be translated, reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, re-cording or otherwise, without the written permission of the publisher. Many of the designations used by manufacturers and sellers to

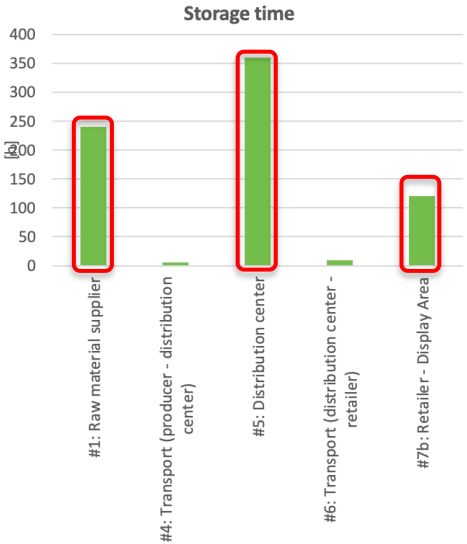
Info | Input | Results

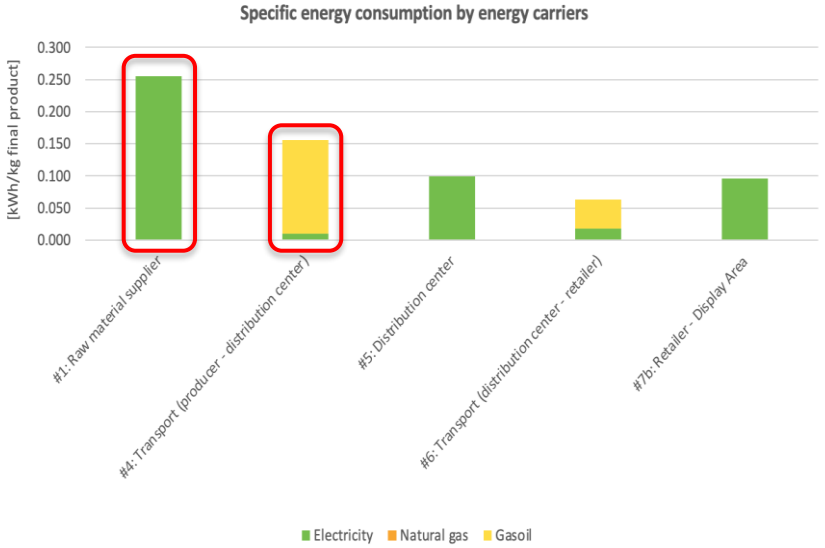
Fish case study

CHILLED FISH

From fish farming to retailer through fish market







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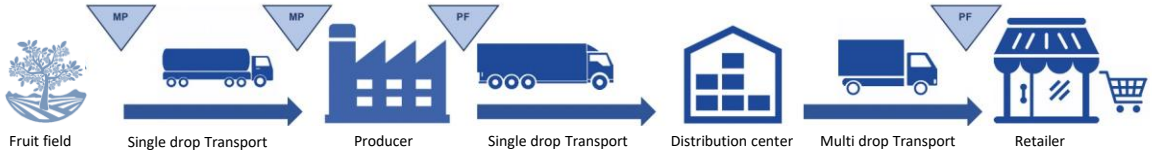
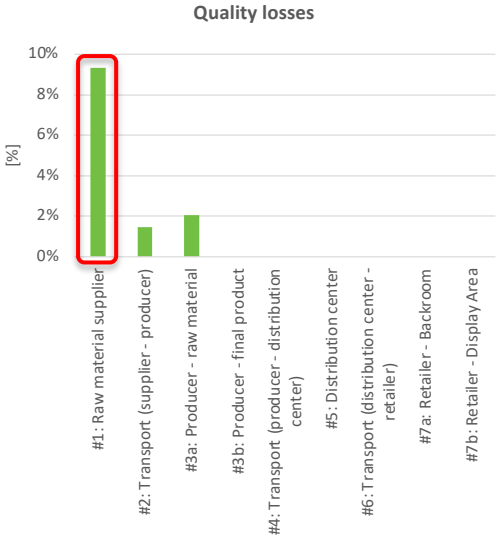
Fish case study - Possible Interventions

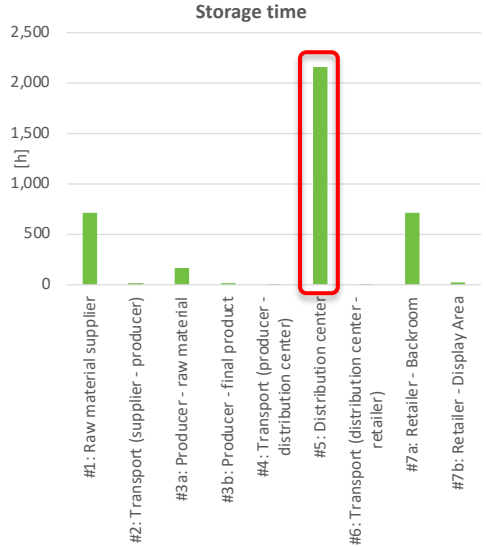
Supply chain stage	Energy efficiency measure	Category	Objective
Raw material supplier/producer	Faster replenishment (smaller lot size)	Management	↓ refrigeration load requirement and energy consumption, ↑ quality
Retailer – Display Area	Improved insulation (reduction of air infiltration of rooms and display area, e.g., by ensuring that door can be closed)	Building	↓ refrigeration load requirement, air infiltration → ↓ energy consumption, ↑ quality
DC	Separated compartments warehouse Use of smart/automatic control system	Building Monitoring and control	↓ refrigeration load requirement, air infiltration → ↓ energy consumption, ↑ quality
Transport Producer – DC DC – Retailer	Alternate means of transport (e.g. portable refrigerated units for LTL) Improved insulation of trucks (e.g., air curtain)	Transport Transport	↓ fuel consumption (↓ air infiltration → ↓ refrigeration load)
Cold chain	Adjustment of cooling temperature	Management	↑ quality

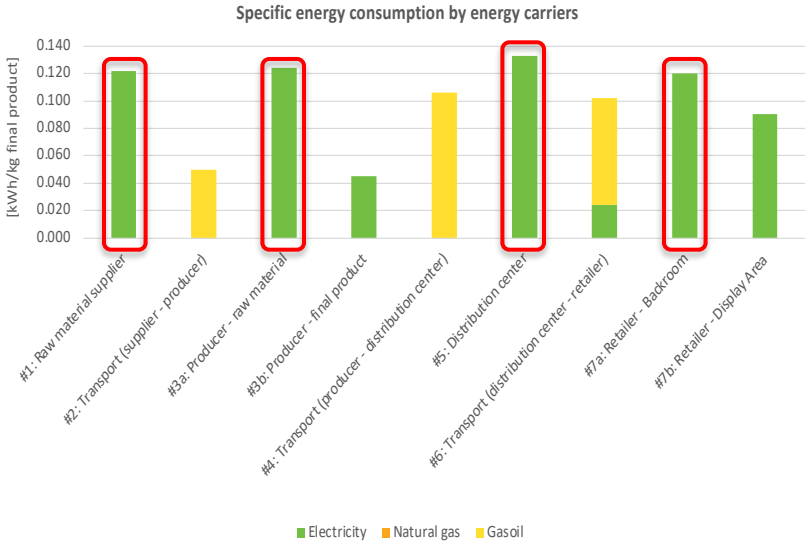
Fruit & vegetables case study

FROZEN FRUIT









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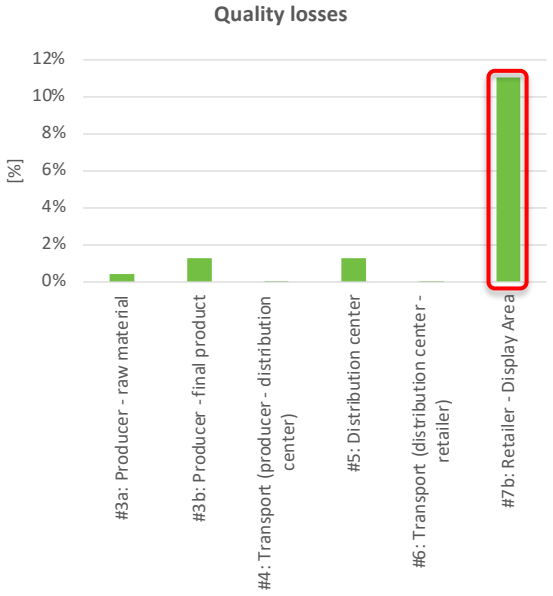
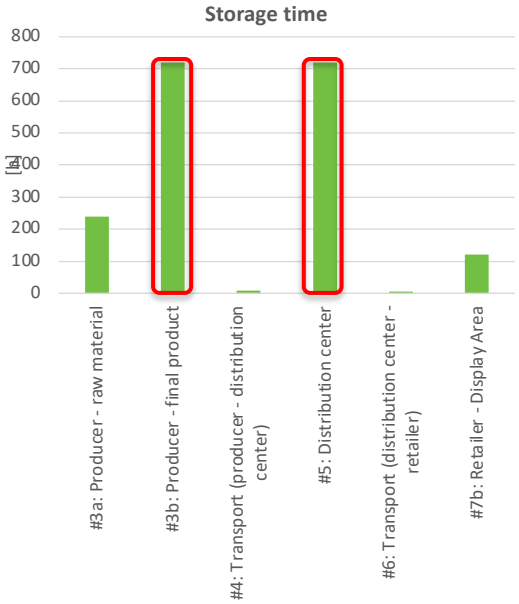
Fruit & vegetables case study - Possible Interventions

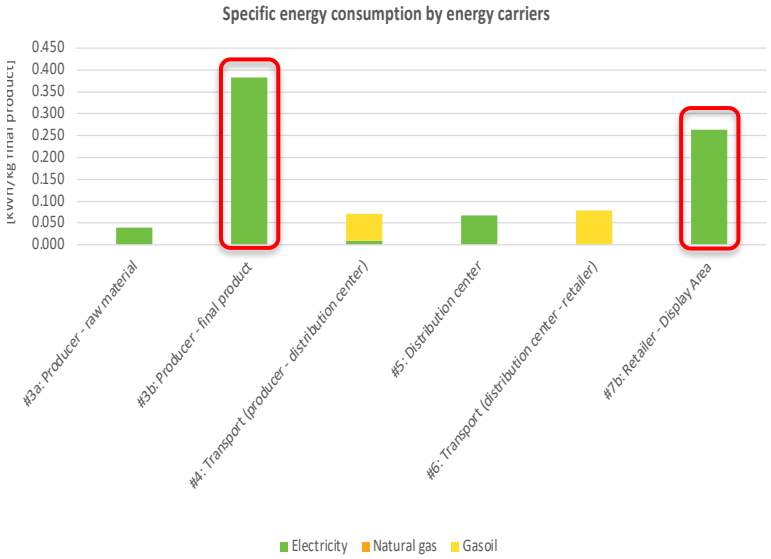
Supply chain stage	Energy efficiency measure	Category	Objective
Producer – PF warehouse DC	Faster replenishment (smaller lot size) Use of smart/automatic control system	Management Monitoring and control	↓ refrigeration load requirement and energy consumption
Raw material supplier	Faster replenishment (smaller lot size)	Management	↓ quality losses, refrigeration load requirement and energy consumption
Retailer – Display Area & Backroom	Separated compartments warehouse Improved insulation (reduction of air infiltration of rooms and display area, e.g., by ensuring that door can be closed)	Building	↓ refrigeration load requirement, air infiltration, and energy consumption
Transport Producer – DC DC – Retailer	Alternate means of transport (e.g. portable refrigerated units for LTL) Improved insulation of trucks (e.g., air curtain)	Transport Transport	↓ fuel consumption (↓ air infiltration → ↓ refrigeration load)
Cold chain	Adjustment of cooling temperature (e.g., -18°C all over the chain instead of -24°C and -20°C)	Management	↓ temperature abuses and energy consumption

Meat case study - Results

CHILLED MEAT







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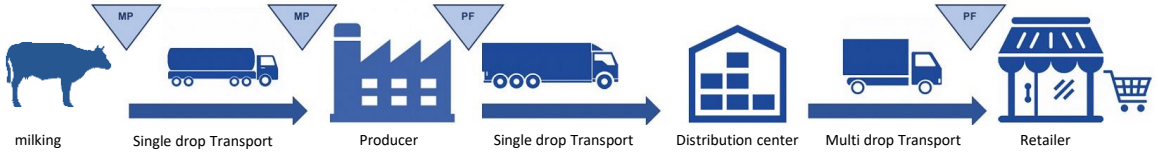
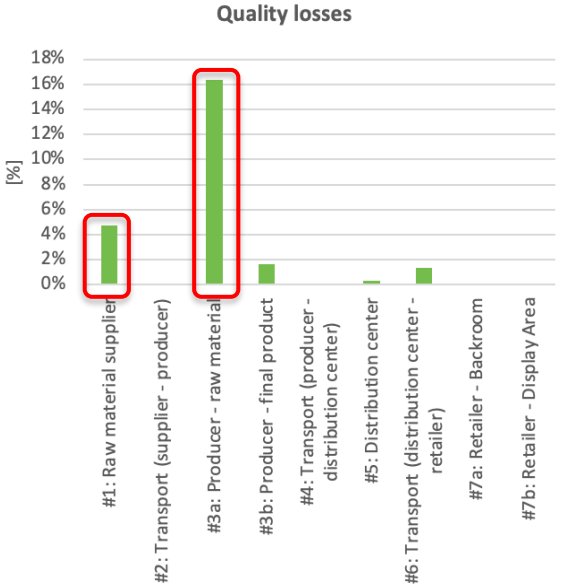
Meat case study – Possible Intervetions

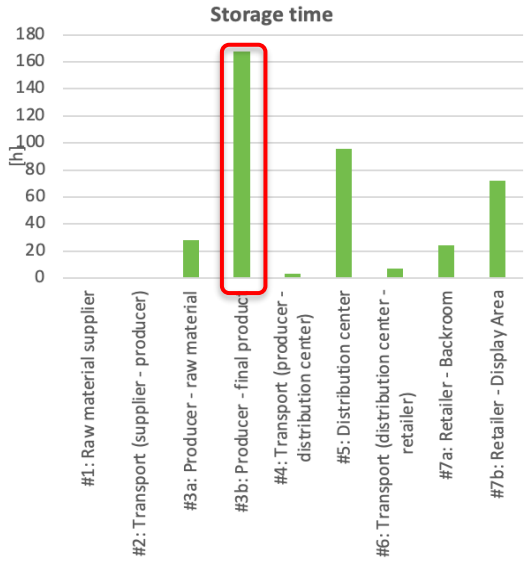
Supply chain stage	Energy efficiency measure	Category	Objective
Raw material supplier/producer	Faster replenishment (smaller lot size)	Management	↓ refrigeration load requirement and energy consumption, ↑ quality
Retailer – Display Area	Improved insulation (reduction of air infiltration of rooms and display area, e.g., by ensuring that door can be closed)	Building	↓ refrigeration load requirement, air infiltration → ↓ energy consumption, ↑ quality
DC	Separated compartments warehouse Use of smart/automatic control system	Building Monitoring and control	↓ refrigeration load requirement, air infiltration → ↓ energy consumption, ↑ quality
Transport Producer – DC DC – Retailer	Alternate means of transport (e.g. portable refrigerated units for LTL) Improved insulation of trucks (e.g., air curtain)	Transport Transport	↓ fuel consumption (↓ air infiltration → ↓ refrigeration load)
Cold chain	Adjustment of cooling temperature	Management	↑ quality

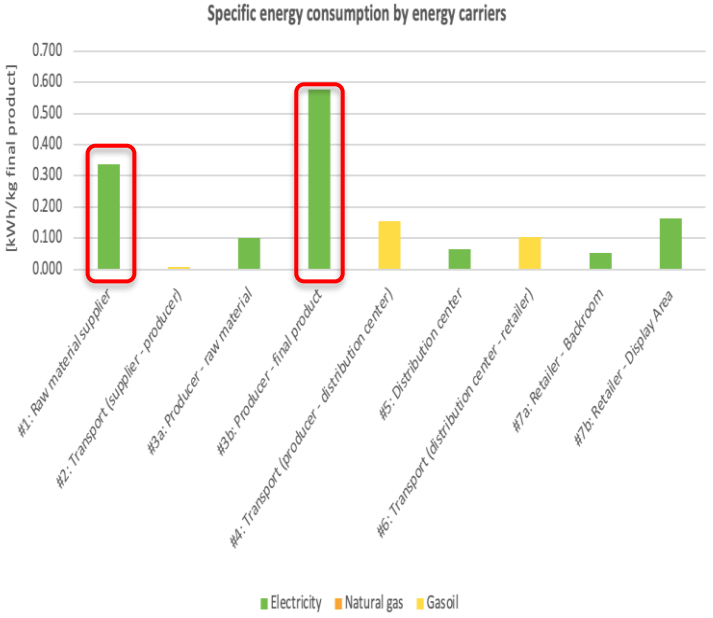
Dairy case study

CHEESE









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Dairy (cheese) case study - Results

Supply chain stage		Category	Objective
Producer – PF warehouse	Faster replenishment (smaller lot size) Review/ optimisation of the cooling distribution system	Management Maintenance	↓ quality losses ↓ energy consumption
Raw material supplier	EMS, energy audit, exploitation of energy benchmarks	Management	↓ energy consumption
Transport Producer - DC	Alternate means of transport (e.g. portable refrigerated units for LTL) Improved insulation of trucks (e.g., air curtain)	Transport Transport	↓ fuel consumption, , ↓ quality losses ↓ fuel consumption, , ↓ quality losses
Cold chain	Adjustment of cooling temperature	Management	↓ energy consumption, ↓ quality losses

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The other ICCEE resources

The IIN Platform: a platform for stakeholder exchange, fostering the link between various market stakeholders and bridging the gap between demand and supply. Available at www.iin-iccee.eu

The ICCEE training: a full capacity building program dedicated to improving the energy performance through direct training and e-learning designed and created by a team of experts. The training is accessible by anyone, free of charge and prepared for self-studying. www.iccee.eu/e-module