

**Global Warming Potential:**

The greenhouse effect is enhanced by human activities. Greenhouse gases are for example carbon dioxide, methane and CFC's. The Global Warming potential is calculated in carbon dioxide equivalents (CO<sub>2</sub>-Eq). This means that the greenhouse potential of an emission is given in relation to CO<sub>2</sub>.

**Carbon footprint:**

Is the individual calculation of the total amount of carbon dioxide (CO<sub>2</sub>) produced per person through energy consumption. 98% of all carbon dioxide - also known as greenhouse gases – are the result from burning fossil fuels.

**Fruit & Vegetable packaging systems in relation to Global warming and the Carbon footprint.**

The environmental impact of the fruit and vegetable distribution in Europe is analysed in a life cycle study. (see: Literature) The study is commissioned by Stiftung Initiative Mehrweg SIM, Germany. Euro Pool System is member of its Board of Governors.

The main application of the study is the provision of a fact-based Life cycle Analysis (LCA) for decision support and can be used for determining the most sustainable form of packaging for the European context. Three packaging systems are compared: wooden boxes, cardboard boxes and plastic crates.

One of the analysed subjects in the study is the Global Warming Potential. The Global Warming Potential is calculated as follows for the 3 different systems:

Based on 3.333.350 rotations:

(values taken from the LCA-report; conservative scenario, table 4-3, page 89)

wooden boxes	cardboard boxes	plastic crates	Global Warming unit
1.218.609	2.359.863	1.106.554	kg CO <sub>2</sub> -Eq
100,00%	193,65%	90,80%	

Scaled to 10 annual rotations per citizen:

(Consumption UK, 2006, per head 150 kg: 77,9 kg vegetables and 72,8 kg fruit).

wooden boxes	cardboard boxes	plastic crates	Global Warming unit
3,66	7,08	3,32	kg CO <sub>2</sub> -Eq

plastic crates instead of cardboard boxes saves: 4 kg CO<sub>2</sub>-Eq

Scaled to 1.000.000 annual rotations:

wooden boxes	cardboard boxes	plastic crates	Global Warming unit
365.581	707.955	331.965	kg CO <sub>2</sub> -Eq

plastic crates instead of cardboard boxes saves: 321.337 kg CO<sub>2</sub>-Eq

Figures Netherlands 2005:

NL: total CO<sub>2</sub> emissions : 189,5 megaton. Average 11.200 kg CO<sub>2</sub> per head, average holiday 419 CO<sub>2</sub> per head.

**Data collection and validation.**

The LCA study includes the following data:

The analyses cover the whole life cycle of the three kinds of packaging from raw material extraction, production, distribution and utilisation to end of life recycling and/or disposal. This includes the exploitation of raw materials and fossil fuels, the forestry, the needed supply of energy and utilities, all needed transport of primary materials and resources and the long distance transports of the fruit and vegetable crates and boxes throughout Europe over the lifetime. (producers: ES/IT/FR/NL/DE – consumers: FR/DE/NL/GB)

Packaging data:

Packaging dimensions: 600 x 400 x 240 mm  
 Palletized : 36 filled boxes per pallet  
 Distribution total: 1.000 tons of F&V - 3.333.350 filled boxes  
 Tare: 15 kg per box  
 Distance per delivery: 1007 km  
 Total distance: 3,36 billion km for 1.000 tons F&V

	wooden boxes	cardboard boxes	plastic crates
System	One-way	One-way	Multi-way
Lifetime			Conservative scenario: 10 years – 50 rotations
Weight per packaging	0,9 kg	0,823 kg	2 kg
Number of packaging	3.333.350	3.333.350	80.000 *)
Total weight	3.000.000 kg	2.743.000 kg	160.000 kg
Service life			3,25 million washings
End of life	Incineration with energy recovery	Incineration with energy recovery + 17,6% recycling	Recycling (Regranulate) 70% of initial value of virgin material.

\*) 66.667 + 13.333 breakage = 80.000 items.

The study is undertaken using a Life Cycle Assessment (LCA) following ISO 14040. The critical review according ISO 14040-44 is prepared by Dekra Umwelt GmbH, Sustainable Management, Germany.

**Literature**

Final report and Executive summary : *“The sustainability of packaging systems for Fruit and Vegetable Transport in Europe based on Life Cycle Analysis.”* - February 2009.

This study was commissioned by Stiftung Initiative Mehrweg SIM, Germany.

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The executive summary can be obtained from your local Euro Pool System office.