



Environmental impact assessment for the European food industry

LCA of food and drink products

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What is Life Cycle Assessment



Standard ISO 14040/44

Example



1. Goal and scope definition

- Functional unit of product
- System boundaries

1 litre of fresh orange juice
Up to packaging process (PET bottle)

2. Inventory analysis

- Use of energy, raw materials, resources
- Emissions

Questionnaire sent to a Spanish company
Orange cultivation, orange pressing...

3. Impact Assessment

- Inventory data are converted into potential environmental impacts

11 impact assessment methods
(defined in Work package 1)

4. Interpretation

- What are the main contributors?
- Needs and opportunities

Orange cultivation and packaging
are the main contributors
Benchmark with other juice producers

Impact Assessment Methods



Impact category	Impact assessment method	Indicator unit
Climate change (GWP)	Bern Model – IPCC (Solomon, 2007)	kg CO ₂ -eq
Eutrophication (EP) terrestrial	Accumulated Exceedance (Seppälä et al., 2006, Posch et al., 2008)	Terrestrial: molc N-eq
Eutrophication (EP) freshwater	EUTREND Model (Goedkoop et al., 2009)	kg P-eq
Eutrophication (EP) marine		kg N-eq
Acidification	Accumulated Exceedance (Seppälä et al., 2006, Posch et al., 2008)	molc H ⁺ -eq
Human toxicity cancer effect	USEtox Model (Rosenbaum et al., 2008)	CTUh (Comparative Toxic unit for humans)
Human toxicity non-cancer effects		CTU _e (Comparative Toxic Unit for ecosystems)
Ecotoxicity		
Land use	Soil organic matter model (Milà i Canals 2007)	kg C deficit
Abiotic resource depletion	CML 2002 (Guinée et al., 2002)	kg antimony (Sb)-eq
Water depletion	Ecological scarcity model (Frischknecht et al., 2009)	European m ³ water-eq

LCA of aquaculture salmon

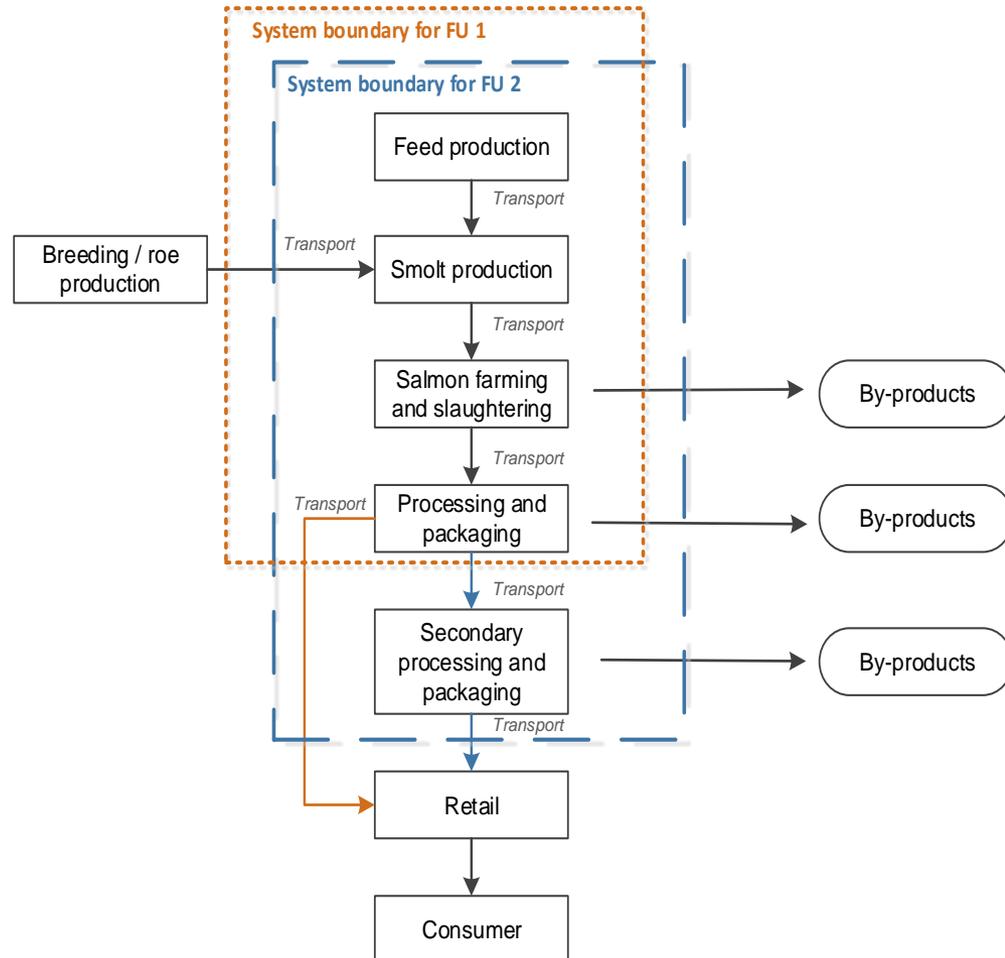


1. Goal and scope

- Functional unit 1
1 kg fresh salmon head on gutted
- Functional unit 2
1 kg smoked salmon fillets

2. Inventory

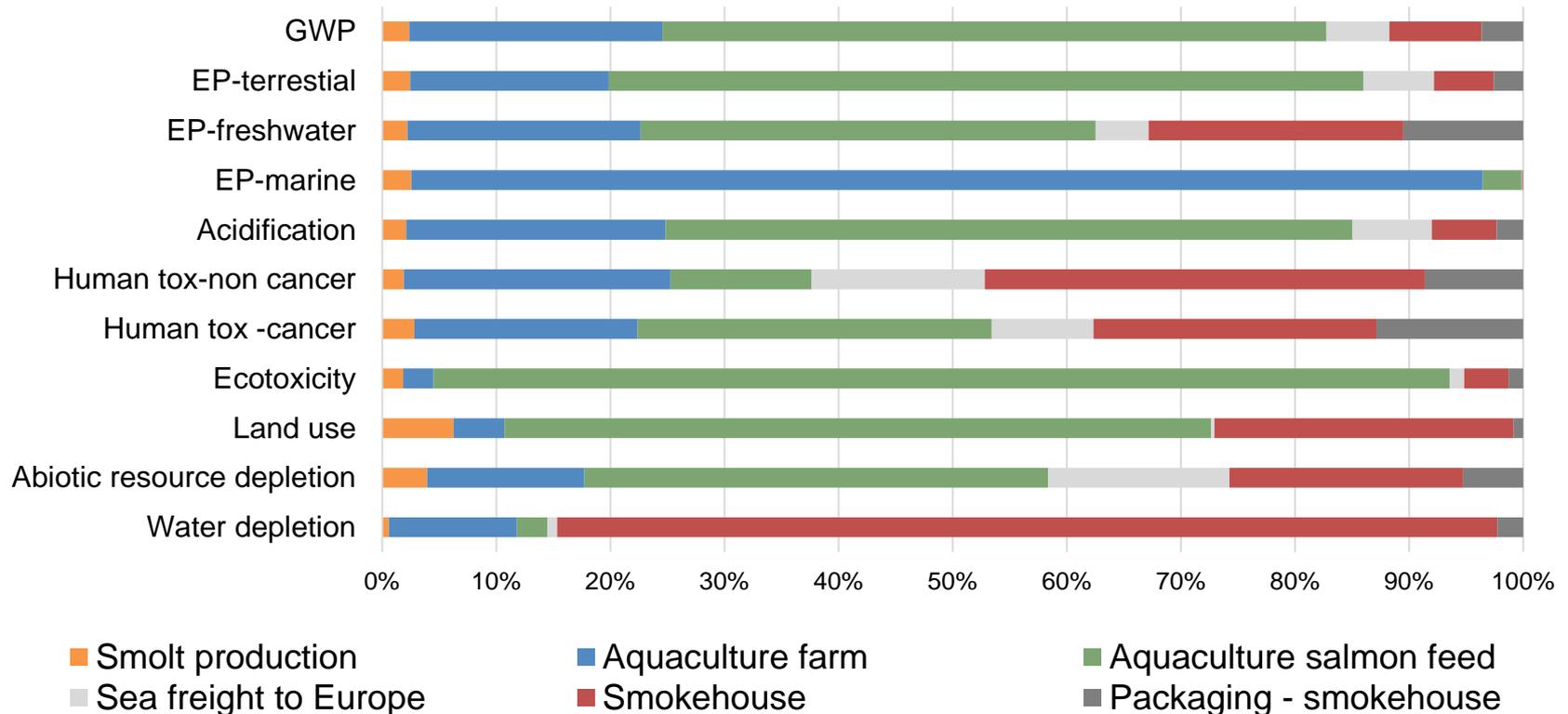
- Icelandic producer
 - Smolt production
 - Aquaculture salmon farm
- French producer
 - Smokehouse



LCA of aquaculture salmon



3. Impact assessment of 1 kg smoked salmon fillets



GWP: Global Warming Potential
EP: Eutrophication

4. Interpretation

- Production of aquaculture salmon feed main contributor in 7 of the 11 assessed impact categories
 - Fuel use, fertilisers, pesticides
- Nutrient pollution main contributor to marine eutrophication
 - Uneaten feed, faeces and dead fish
- Smokehouse operation contributes most to human toxicity and water depletion
- Benchmarking:
 - 5.0 kg CO₂-eq/kg smoked salmon fillet
 - 2.7 kg CO₂-eq/kg salmon, head on gutted

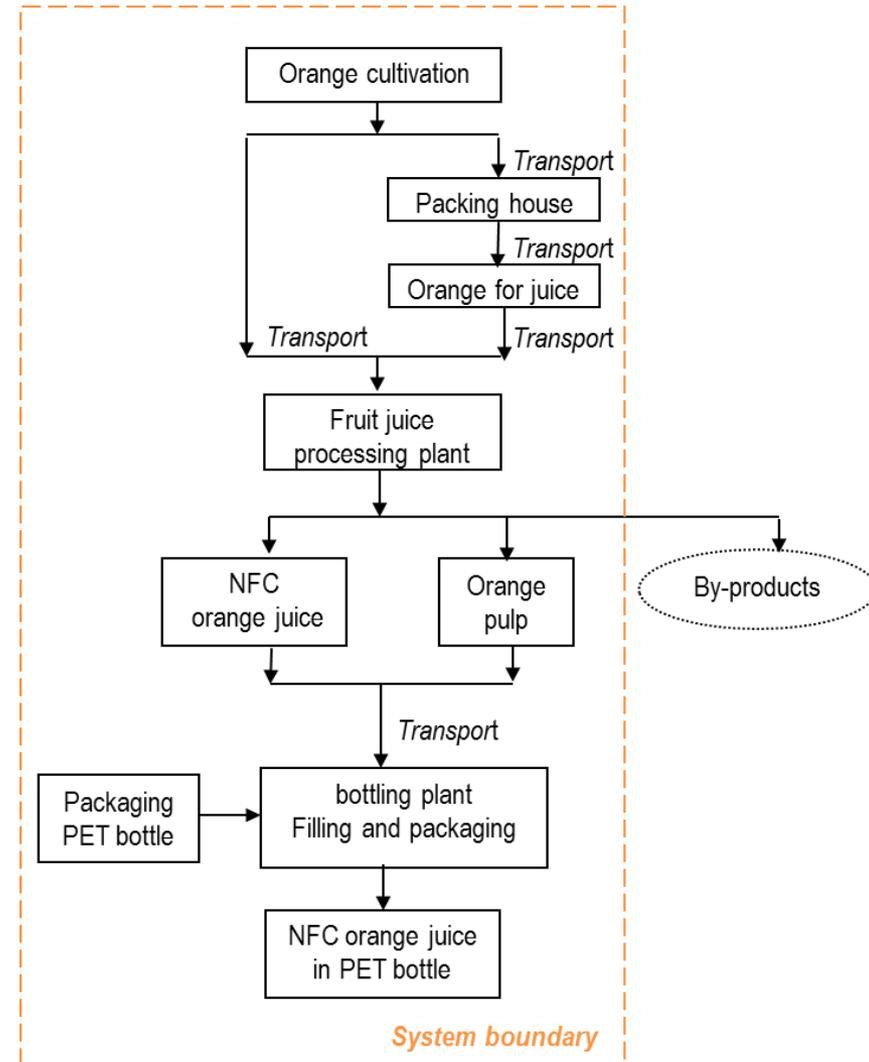
LCA of NFC Orange juice

1. Goal and scope

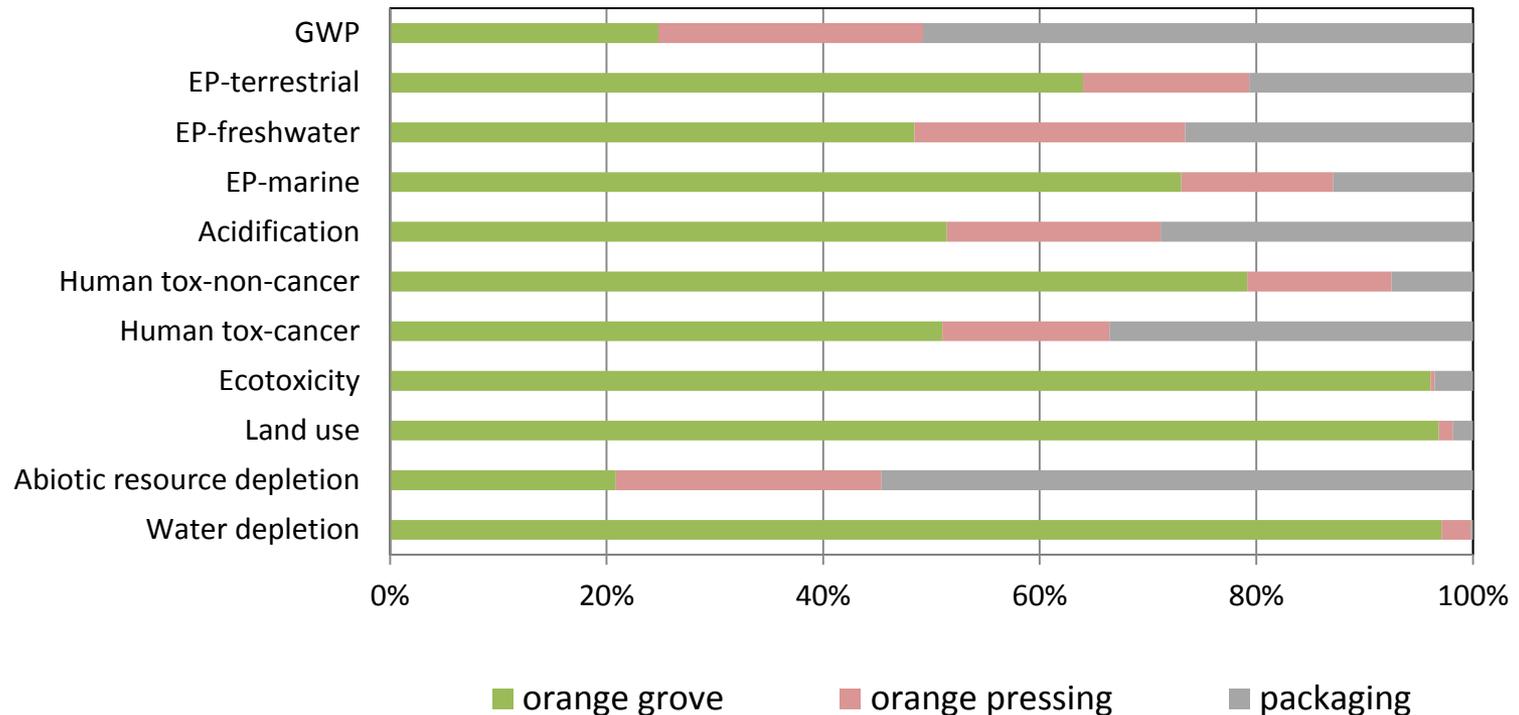
- 1 litre NFC Orange juice
Not From Concentrate

2. Inventory analysis

- Spanish Producer
 - Orange cultivation
 - Orange juice



3. Impact assessment of one litre NFC orange juice



GWP: Global Warming Potential
EP: Eutrophication

4. Interpretation

- Packaging more than 50% to GWP and Abiotic resource depletion
 - PET material and bottle production
- Orange cultivation main contributor for other impact categories
 - Land use, fertilisers, energy use for irrigation
- Benchmarking: 0.7 kg CO₂-eq/litre orange juice
 - Low value compared to literature data due to fertirrigation

LCA of Beef and dairy products

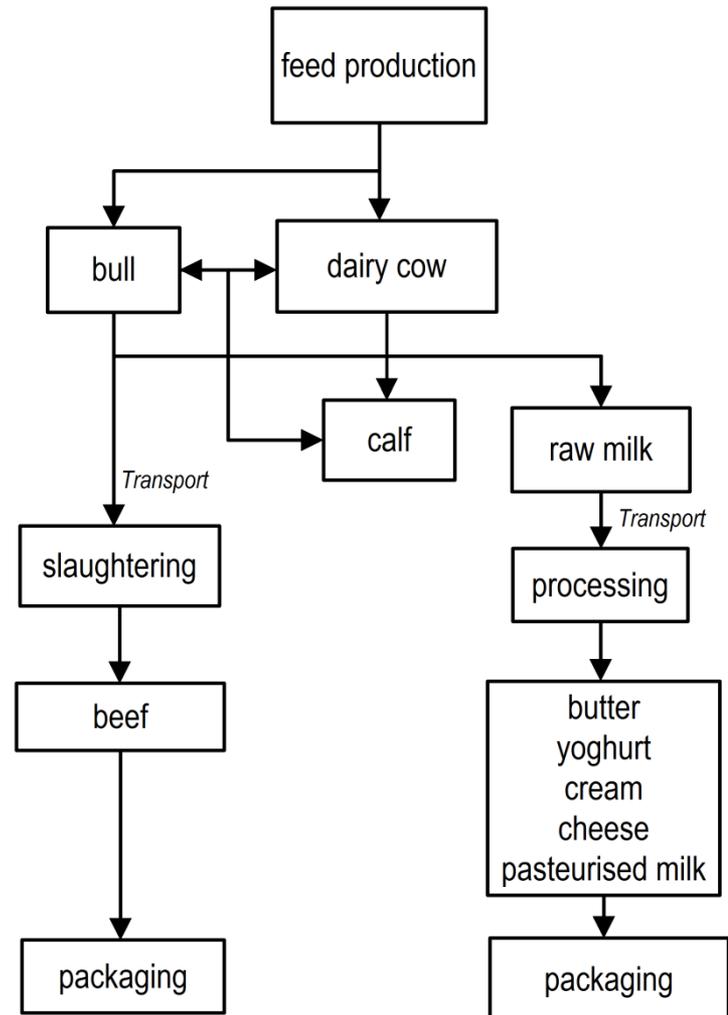


1. Goal and scope

- Dairy farm in Romania
- Feed production at farm

2. Inventory analysis

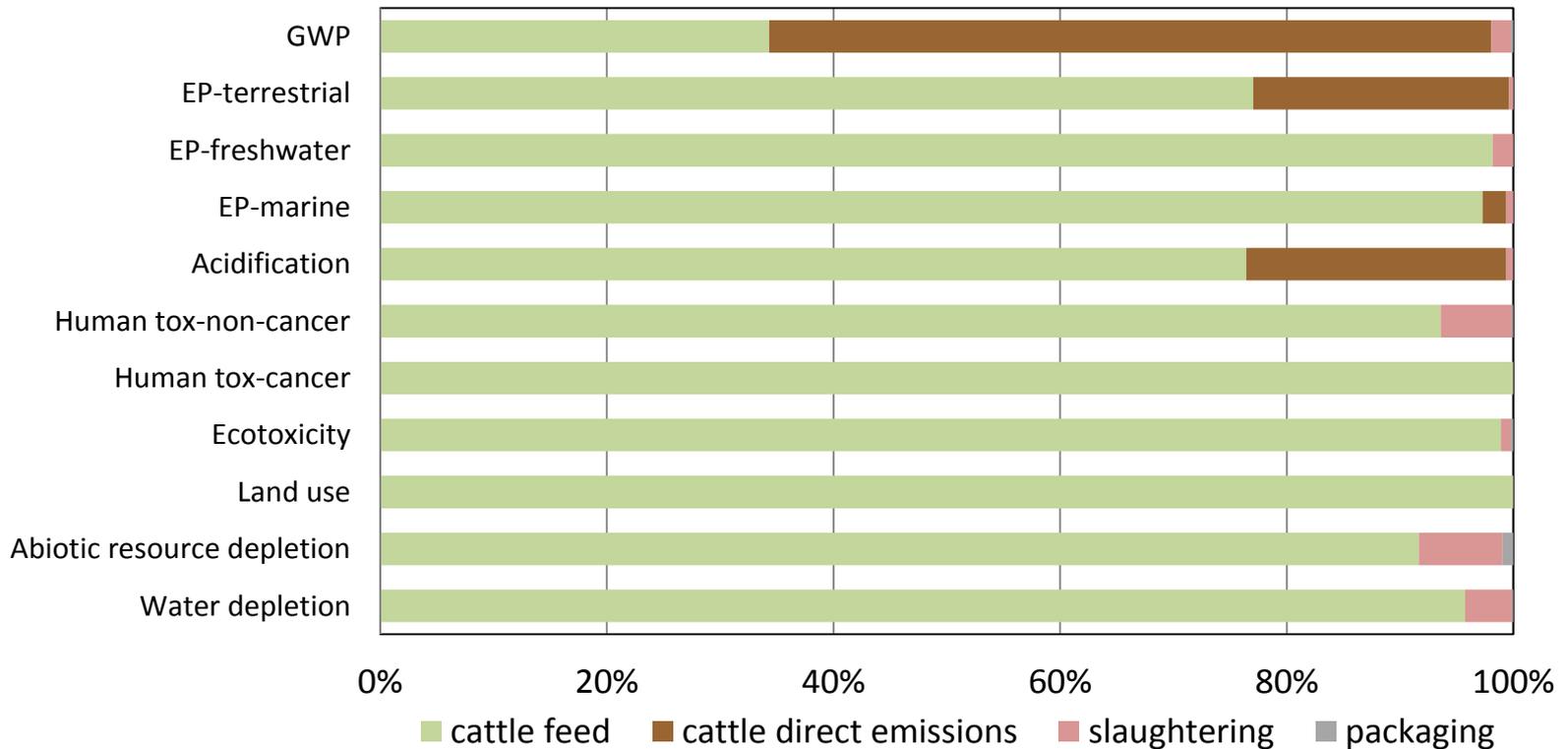
- Romania
 - Dairy farm
 - Feed production
 - Slaughtering
 - Milk processing



LCA of beef and dairy products



3. Impact assessment of 1 kg beef at slaughterhouse



GWP: Global Warming Potential

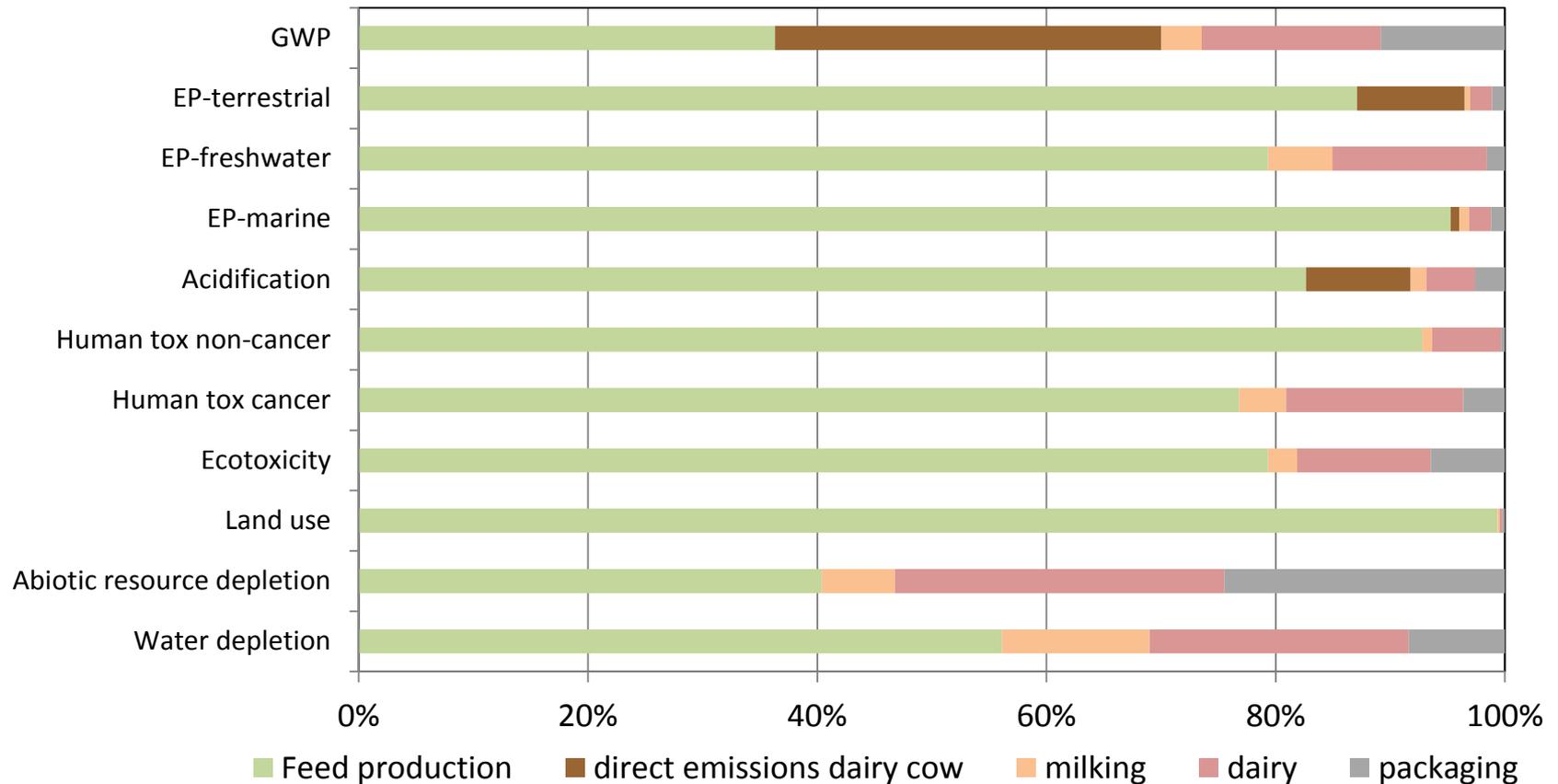
EP: Eutrophication

cattle: cull dairy cow and bulls

LCA of beef and dairy products



3. Impact assessment of 1 litre whole milk at dairy plant



GWP: Global Warming Potential

EP: Eutrophication

4. Interpretation

- Main contributors:
 - Feed cultivation main contributor
 - Land use, fertilisers, manure, energy use for tractors
 - Cattle husbandry: methane emissions
 - Dairy: energy use for dairy products
- Benchmarking:
 - 33 kg CO₂-eq/kg beef
 - 1.9 kg CO₂-eq/l pasteurised milk

- What is the aim of these LCA?

 Identify essential input data

- Similarities:

- Impacts of feed production: pesticides, fertilisers, land use, energy use
- Impacts of animal husbandry: emissions
- Processing into food for human consumption: energy and water use, packaging

 Propose key environmental performance indicators (KEPIs)