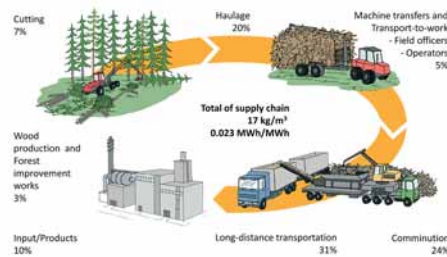


# Energy Efficiency and CO<sub>2</sub>-eq Emissions of Forest Chip Supply Chains in Finland 2020

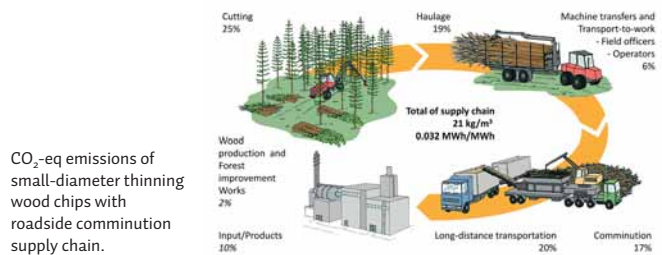
Arto Kariniemi  
Kalle Kärhä  
Metsäteho Oy

The research carried out by Metsäteho Oy calculated what would be the total fuel consumption and CO<sub>2</sub>-eq emissions of forest chip production if the use of forest chips is 24 TWh in 2020 in Finland.

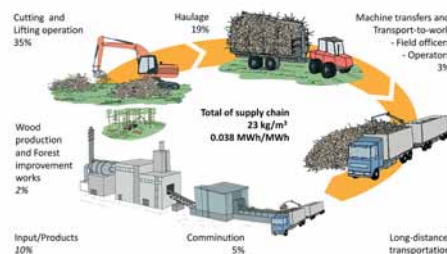
- If the production and consumption of forest chips in Finland are 24 TWh in 2020, then:
  - The total CO<sub>2</sub>-eq emissions would be around 245 000 tonnes.
  - The volume of diesel consumption was 79 million litres and petrol 1.5 million litres.
  - Electric rail transportation and comminuting at the mill site consumed 15 GWh of electricity.
- The supply chain with the lowest CO<sub>2</sub>-eq emissions was logging residues comminuted at plant.
  - The highest CO<sub>2</sub>-eq emissions came from stump wood when operating with terminal comminuting.
- The study results indicated that the energy input/output ratio of forest biomass is good.
  - Energy input/output ratio in the total volume was 0.030 MWh/MWh which varied from 0.022 to 0.044 between the supply systems researched.
  - Forest chip production gave a net of some 97% of the energy content delivered at the plant.



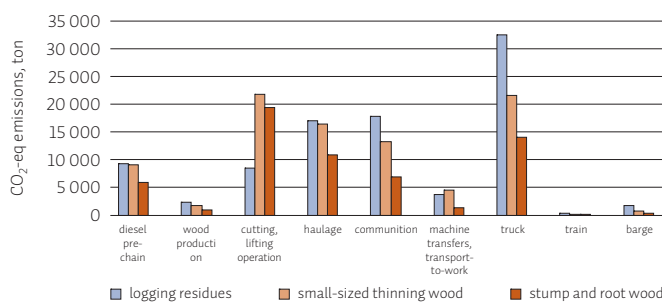
CO<sub>2</sub>-eq emissions of logging residue chips with roadside comminution supply chain.



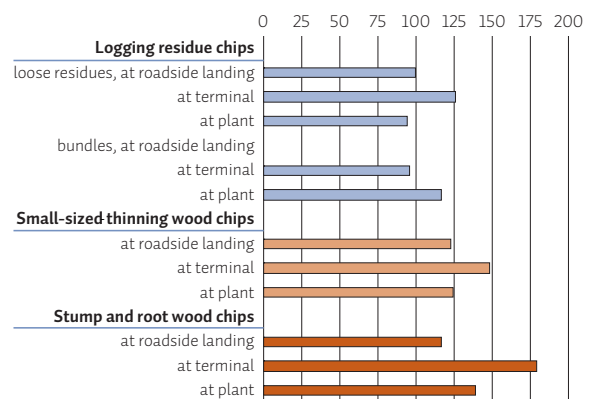
CO<sub>2</sub>-eq emissions of small-diameter thinning wood chips with roadside comminution supply chain.



CO<sub>2</sub>-eq emissions of stump and root wood chips with supply chain based on comminution at plant.



Volume of CO<sub>2</sub>-eq emissions of a study, 245 000 tonnes in total, with the supply sources used.



Relative CO<sub>2</sub>-eq emissions of forest chip supply chains in the study. CO<sub>2</sub>-eq emissions of 100 = Logging residues, comminution at roadside landing.