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FROM KNOWLEDGE TO IMPACT

Emissions reduction calculation

Pellon Group

Envitecpolis Oy

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Implementation of the review

- The starting point for this work is to examine the change in greenhouse gas emissions when changing from tractor-driven feeding to filling table feeding.
- The analysis was carried out on the basis of two case studies. One of the farms is a dairy farm and the other one is a beef production farm.
- The only change in greenhouse gas emissions taken into account was the change in the fuel consumption of the mixer wagon and the electricity consumption of the filling table.
- The fuel requirement for the wagon was set at 20 l/hour and the operating time was set at 2.5 h/day on a dairy farm and 2 h/day on a meat farm.
- The monitoring data of the electricity comsumption of the filling table was obtained from a farm using Pellon Feedline with two filling tables The monitoring data was calculated per animal unit, so that it could be used in the calculation of the example farms.
- The emission factors for fuel and electricity are taken from the Energy Authority and Statistics Finland's annual emission factors 2023 for electricity and fuel oil in Finland.

Considered example farms

MILKING FARM

Number of animals	250 head, milking 120 head
Milk production (fat-protein corrected)	1 233 000 l/y
Mixer wagon feeding for all animal groups	3 recipes
Fuel consumption	39 700 l/y
Electricity consumption	165 500 kWh/h
Cultivation	
Silage	185 ha
yield level	7 000 ka kg / ha
Barley	15 ha
yield level	5 000 kg/ha

BEEF PRODUCTION FARM

Number of animals	150 bulls, 150 heifers
Slaughtering	105 500 slaughter kg / y
Calves purchased	295 calves
Mixer wagon feeding for all animal groups	2 recipes
Fuel consumption	25 000 l/y
Electricity consumption	66 400 kWh/h
Cultivation	
Silage	75 ha
yield level	7 000 ka kg / ha
Barley	25 ha
yield level	5 000 kg/ha

RESULTS

Change of output data

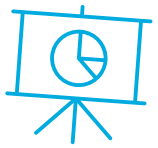
MILKING FARM

Number of animals	250 head, milking 120 head
Milk production (fat-protein corrected)	1 233 000 l/y
Mixer wagon feeding for all animal groups	3 recipes
Fuel consumption	39 700 l/ y → 21 050 l/y
Electricity consumption	165 500 kWh /y → 196 196 kwh /y
Cultivation	
Silage	185 ha
yield level	7 000 ka kg / ha
Barley	15 ha
yield level	5 000 kg/ha

BEEF PRODUCTION FARM

Number of animals	150 bulls, 150 heifers
Slaughtering	105 500 slaughter kg/ y
Calves purchased	295 calves
Mixer wagon feeding for all animal groups	2 recipes
Fuel consumption	25 000 l/ y → 10 400 l/y
Electricity consumption	66 400 kWh /y → 114 064 kWh/y
Cultivation	
Silage	75 ha
yield level	7 000 ka kg / ha
Barley	25 ha
yield level	5 000 kg/ha

Result



The result CO_2 kg /kg of milk or slaughter kg shows how many kilograms of emissions (converted to carbon dioxide) are produced when producing one litre of milk (fat-protein-corrected) or one kg of meat.

The calculation takes into account the key factors in milk production greenhouse gas emissions, which are carbon dioxide, nitrous oxide and methane. The impact of these gases on the atmosphere is different.
In the result, the effect of nitrous oxide and methane has been modified to match the 100-year global warming effect of carbon dioxide (GWP), resulting in a single figure, the carbon dioxide equivalent (CO2e).
The results are based on a fat-protein-fixed milk volume, that gives results which are comparable between farms.

Full results

MILKING FARM

- 43 300
kg CO2e / Y

equivalent to about 4.5 of the annual emissions of a Finn *

- 3,3 %
of total emissions

BEEF PRODUCTION FARM

- 33 000
kg CO2e / Y

equivalent to about 3.5 of the annual emissions of a Finn *

- 2,8 %
of total emissions

* Sitra 2023, https://www.sitra.fi/artikkelit/keskivertosuomalaisen-hiilijalanjalki/

Results in relation to production

MILKING FARM

0,98
kg CO2e / milk kg

- 3,3 %

0,94
kg CO2e / milk kg

CO2 -free electricity

- 3,3 %

0,94
kg CO2e / milk kg

BEEF PRODUCTION FARM

17,69
kg CO2e / slaugter kg

- 2,8 %

17,20
kg CO2e / slaughter kg

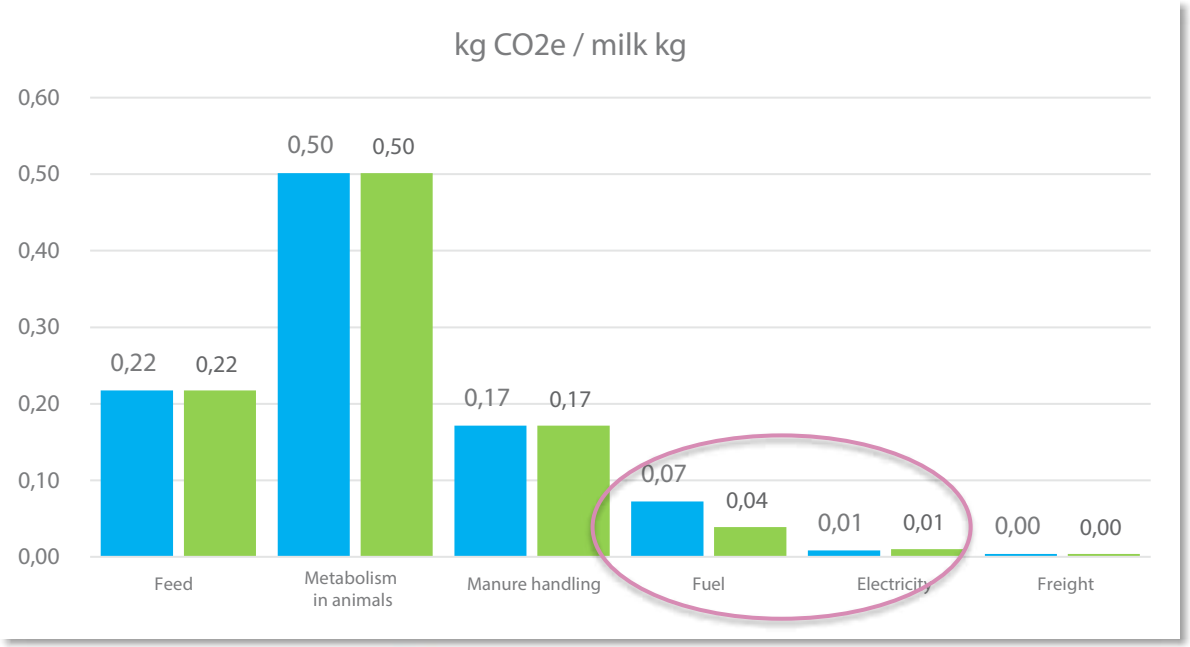
CO2 -free electricity

- 3,5 %

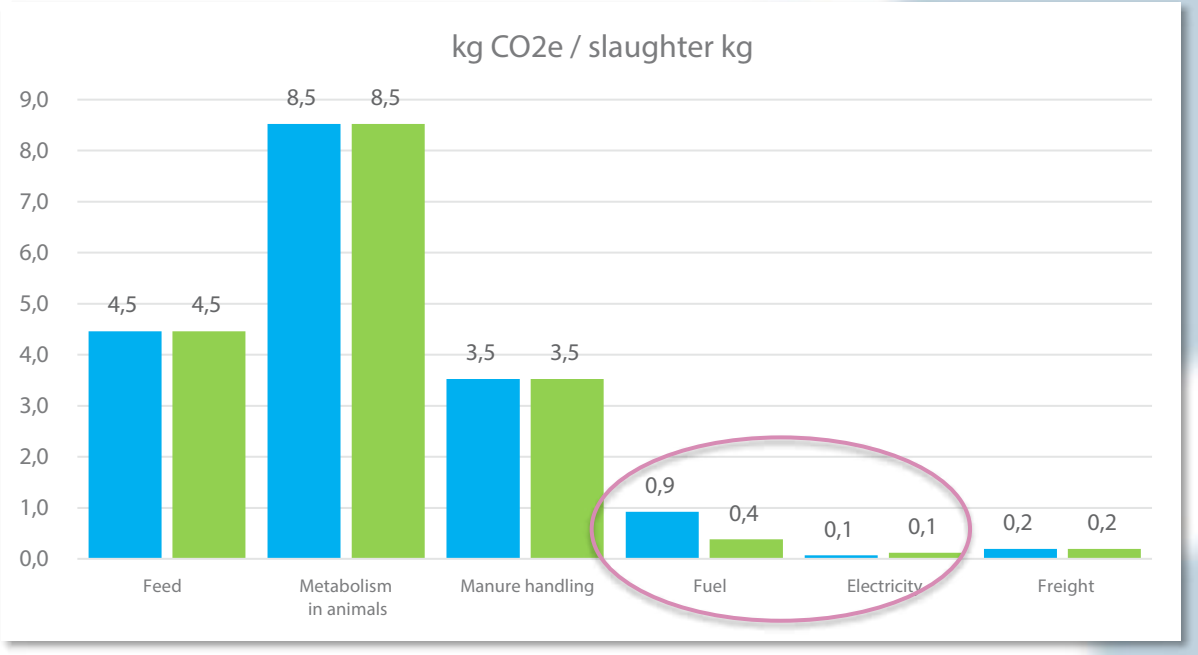
17,08
kg CO2e / slaughter kg

Change in the distribution of emissions

MILKING FARM



BEEF PRODUCTION FARM



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Conclusions

- As a single change, the conversion from tractor-driven mixer wagon to filling table will have a significant impact on greenhouse gas emissions from the farm.
- This is influenced by the higher GHG emissions from fossil fuels compared to electricity production.
- It is worth noting that the origin of the electricity used plays a role in reducing emissions and the advantage may be reduced if fossil fuels or peat are used to generate electricity.
- The importance of the origin of electricity is more pronounced on meat farms, where the contribution of electricity to total emissions is higher.
- It is important to understand that greenhouse gas emissions from milk and meat production are influenced by many different factors, which vary between farms. These results are calculated using example farms. The farms are average farms in their size range.
If an accurate farm-specific emission reduction effect is desired, it should be calculated using the farm's own indicators. However, it can be concluded that the change will reduce the emissions of milk and emissions from the meat production farm.