



# TOWARDS CARBON-NEUTRAL MILK CHAIN 2035

Aleksi Aastapsev, Development Manager, LCA-expert  
Valio Ltd/ClimateSolutions

**Juha  
Nousiainen**



# ClimateSolutions Team

**Jaakko Luoma**



**Aleksi Astaptsev**



**Tuuli Hakala**



**Virpi  
Kling**



**Robert Harmoinen**



# THE CARBON FOOTPRINT OF MILK, FROM FIELD TO TABLE



**93**  
%

## PRIMARY PRODUCTION AT FARM

- 4,5 % Fertilizer production
- 4,5 % Manure handling: methane and nitrous oxide
- 6 % Energy use at farm: fuels and electricity
- 26 % Feed cultivation: nitrous oxide
- 49 % Cows rumination: methane
- 3 % Other inputs

**5**  
%

## LOGISTICS AND FACTORIES

- 1,5 % Logistics
- 3,5 % Energy use at factories

**2**  
%

## PACKAGING

In calculating the carbon footprint, the different greenhouse gases are converted to a common format, carbon dioxide equivalent (CO<sub>2</sub>e). The lifecycle calculation model of Valio's raw milk was certified in 2022 (Carbon Trust)

# VALIO'S ACTIONS TO REDUCE EMISSIONS

**15 %**



## Biogas production and utilization

- Emission reduction from manure storage
- Fertilizer usage reduction
- Usage of biogas in heavy transports reducing usage of fossil fuels
- Utilization of manure as cow bedding material replacing peat
- Utilization of manure fractions in commercial seedbed solutions reducing the usage of peat

**24 %**



## Animal welfare, feeding, and breeding

- Improving the welfare and health of cows
- Feed that mitigates methane emissions
- Animal breeding towards resource efficient and welfare dairy herds

**20 %**



## Emission reductions from peatlands

- Continuous grass cover
- Reducing tillage of soil
- Raising groundwater level
- Restoration or afforestation of low-yield fields

TOWARDS  
**CARBON-NEUTRAL**  
daily 2035

**8 %**



## Renewable energy and energy efficiency

- Increasing energy efficiency in dairy farms, factories and logistics
- Increasing renewable energy use throughout the value chain

**19 %**



## Carbon farming

- Carbon sequestration into mineral soils
- Improving soil condition
- Boosting crop yields
- Utilisation of legumes in farming
- Fertilisation methods with lower emissions

**14 %**



## New emission reduction technologies

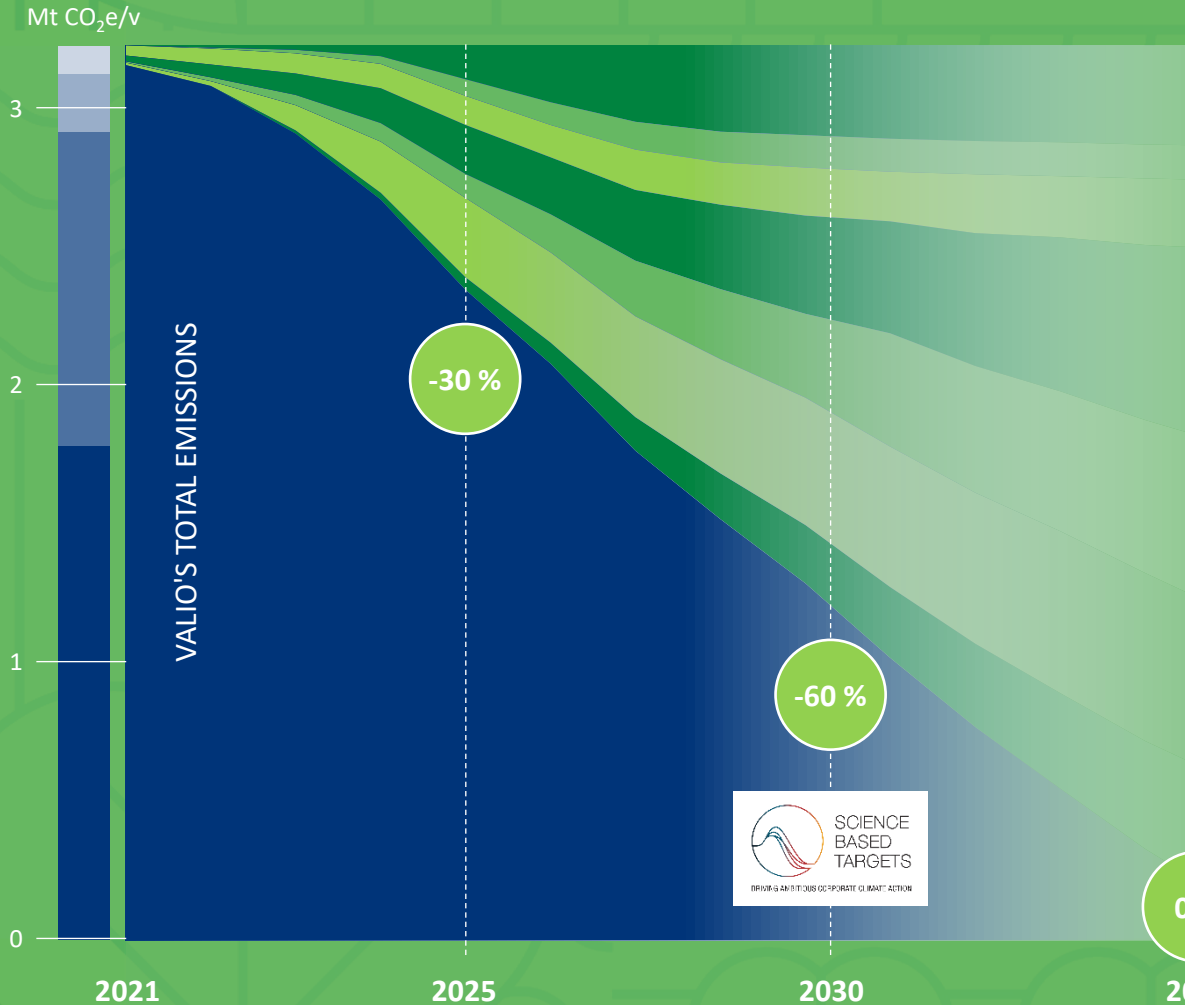
- Recycling of agricultural plastics
- Bioenergy carbon binding and storage using new technologies
- Methane decomposition from barn air with new technology



# VALIO'S CLIMATE PROGRAMME: TARGET OF NET ZERO EMISSIONS BY 2035

VALIO FI TOTAL EMISSIONS 2019  
3.24 Mt CO<sub>2</sub>e

- **3.5%** Other value chain emissions
- **6.5%** Energy of factories and logistics
- **35%** Soil carbon emissions
- **55%** Milk production in dairy farms



## VALIO'S ACTIONS TO REDUCE EMISSIONS

- 11 %** Biogas use in logistics
- 4 %** Development of manure handling
- 8 %** Renewable energy and energy efficiency
- 24 %** Animal welfare, feeding, and breeding
- 20 %** Emission reductions from peatlands
- 19 %** Increasing carbon farming on grasslands
- 14 %** New emissions reduction technologies



7

EXPERTISE



9

MONITORING



14

COOPERATION



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HIILINEUTRAALIA  
maitoa 2035



# VALIO CARBO® FARM CALCULATOR

Certified (Carbon Trust) four times

Farm-level calculations

It uses mainly IPCC Tier 3 calculation methods.

It helps farmers to reduce the CFP of raw milk, beef, and feeds. Also, eutrophication and acidification.

Lypsikki LCA: Valio-Atria-Natural Resource Institute

# IMPORTANCE OF TIER 3 CALCULATIONS

Tier 1

EQUATION 10.22

CH<sub>4</sub> EMISSIONS FROM MANURE MANAGEMENT

$$CH_{4\text{Mamure}} = \sum_{(T)} \frac{(EF_{(T)} \cdot N_{(T)})}{10^6}$$

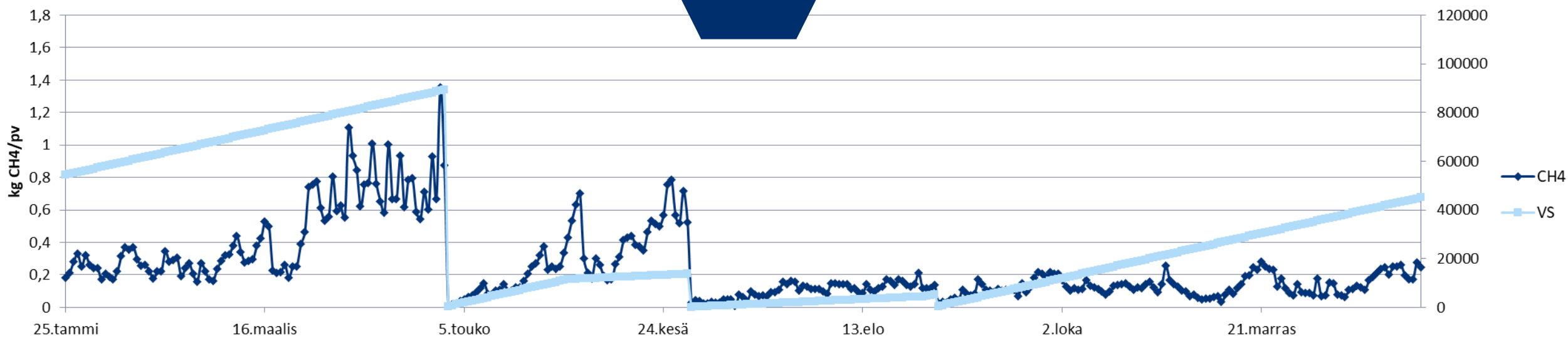
Tier 2

EQUATION 10.23

CH<sub>4</sub> EMISSION FACTOR FROM MANURE MANAGEMENT

$$EF_{(T)} = (VS_{(T)} \cdot 365) \cdot \left[ B_{o(T)} \cdot 0.67 \text{ kg} / \text{m}^3 \cdot \sum_{S,k} \frac{MCF_{S,k}}{100} \cdot MS_{(T,S,k)} \right]$$

Tier 3





# CARBO® FARM CALCULATOR

**4,000**  
Valio Dairy  
Farms

**3,241**  
Users  
Registered

**21,083**  
Calculations  
Overall

**102**  
Calculations  
from 2019  
data

**1,138**  
Calculations  
from 2020  
data

**1,916**  
Calculations  
from 2021  
data

**2,352**  
Calculations  
from last  
year data

**212**  
Trainings  
held

**2 %**  
Calculation  
errors

**74 %**  
Of received  
raw milk

**3,000**  
Calculations  
goal 2023





**THANK YOU!**

Aleksi Astartsev  
Valio Ltd/ClimateSolutions

# Development of Calculator

Feed  
Optimization  
Tool

Nutrient  
Balance  
tool

Lypsikki

Juha Nousiainen  
&  
Pekka Huhtanen

Valio

Lypsikki  
LCA

Calculations:  
Valio  
UI:  
Biocode

Valio  
Carbo  
Ympäristö-  
laskuri

Laskenta:  
Valio  
&  
Luke

Lypsikki  
LCA 2.0

IT, UI:  
GOFORE

Carbo  
National  
Cattle  
Calculator

# Next Steps

Add-ons in the works :

- 3NOP
- Regional Temperatures
- Biogas Production

Later:

- Carbon Sequestration
- Better Peatland models

Environmental impacts:

- Water Footprint
- Energy Footprint
- Land Use
- Biodiversity

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# Logistics

We have developed our emission models for milk collection and distribution.

The models are based on values from the LIPASTO unit emission database.

We can even determine the climate emissions of individual transports.



BIOGAS



SUSTAINABLE  
PURCHASES



# Factories

We analyze the production as a whole and not individual products.

However, Valio has thousands of products, which makes product-specific calculations challenging.

The producers ascertain the climate effects of raw materials and packages.

Our plan is to automatize whole calculation

WASTE  
REDUCTION



STABLE  
PRODUCTION



# Uncertainties

SCOPE &  
GOAL

DIFFERENT  
STANDARDS  
AND  
GUIDELINES

CHARACTERI-  
ZATION  
FACTORS

ALLOCATION

FUNCTIONAL  
UNITS

CALCULATION  
ACCURACY

SYSTEM  
BOUNDARIES

# Many Results for Same Product

		Functional unit (kg CO2e)							
Allocation	CCFB	/kg ECM		/kg FPCM		/kg raw milk		/kg beef	
		All Crops	Feed Only	All Crops	Feed Only	All Crops	Feed Only	All Crops	Feed Only
NEA	NO	1.120	0.965	1.155	0.996	1.205	1.039	3.047	2.715
EA	NO	1.111	0.957	1.146	0.988	1.195	1.031	4.722	4.158
PA	NO	1.105	0.953	1.137	0.980	1.186	1.022	5.809	5.008
BPA1	NO	1.028	0.886	1.061	0.915	1.106	0.954	20.670	17.894
BPA2	NO	0.989	0.853	1.018	0.877	1.061	0.915	28.221	24.330
BPA3	NO	0.993	0.856	1.022	0.881	1.066	0.919	27.432	23.651
NEA	YES	1.278	1.108	1.318	1.144	1.375	1.193	3.387	3.023
EA	YES	1.268	1.100	1.308	1.135	1.364	1.183	5.299	4.681
PA	YES	1.261	1.094	1.297	1.126	1.353	1.174	6.628	5.750
BPA1	YES	1.174	1.018	1.210	1.050	1.262	1.095	23.510	20.468
BPA2	YES	1.129	0.979	1.161	1.007	1.211	1.051	32.200	27.937
BPA3	YES	1.133	0.983	1.166	1.012	1.216	1.055	31.301	27.157
NEA	IPCC 2007	1.094	0.925	1.129	0.954	1.177	0.995	2.992	2.628
EA	IPCC 2007	1.086	0.917	1.120	0.947	1.168	0.988	4.629	4.011
PA	IPCC 2007	1.080	0.913	1.111	0.940	1.159	0.980	5.677	4.799
BPA1	IPCC 2007	1.005	0.849	1.037	0.876	1.081	0.914	20.212	17.171
BPA2	IPCC 2007	0.967	0.817	0.995	0.841	1.037	0.877	27.579	23.316
BPA3	IPCC 2007	0.971	0.821	0.999	0.844	1.041	0.880	26.809	22.665

# Summing-up

Individual carbon footprint results are misleading and difficult to understand without context.

Calculating environmental impacts using life cycle assessment is mostly intended for producers, so that they can find ways to be more environmentally friendly and efficient and not just print a number on the packaging.

The most important thing is to do handprint work, i.e. reduce the carbon footprint, regardless of its size. The carbon footprint result varies continuously and is never constant. Accurate calculation shows the real change and not just a calculated variation.