TOWARDS CARBON-NEUTRAL MILK CHAIN 2035

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

ClimateSolutions Team


Juha Nousiainen


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 (CO2e). 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

8 %

Renewable energy and energy efficiency

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

20 %

Emission reductions from peatlands

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

19 %

Carbon farming

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

TOWARDS CARBON-NEUTRAL dairy 2035

14 %

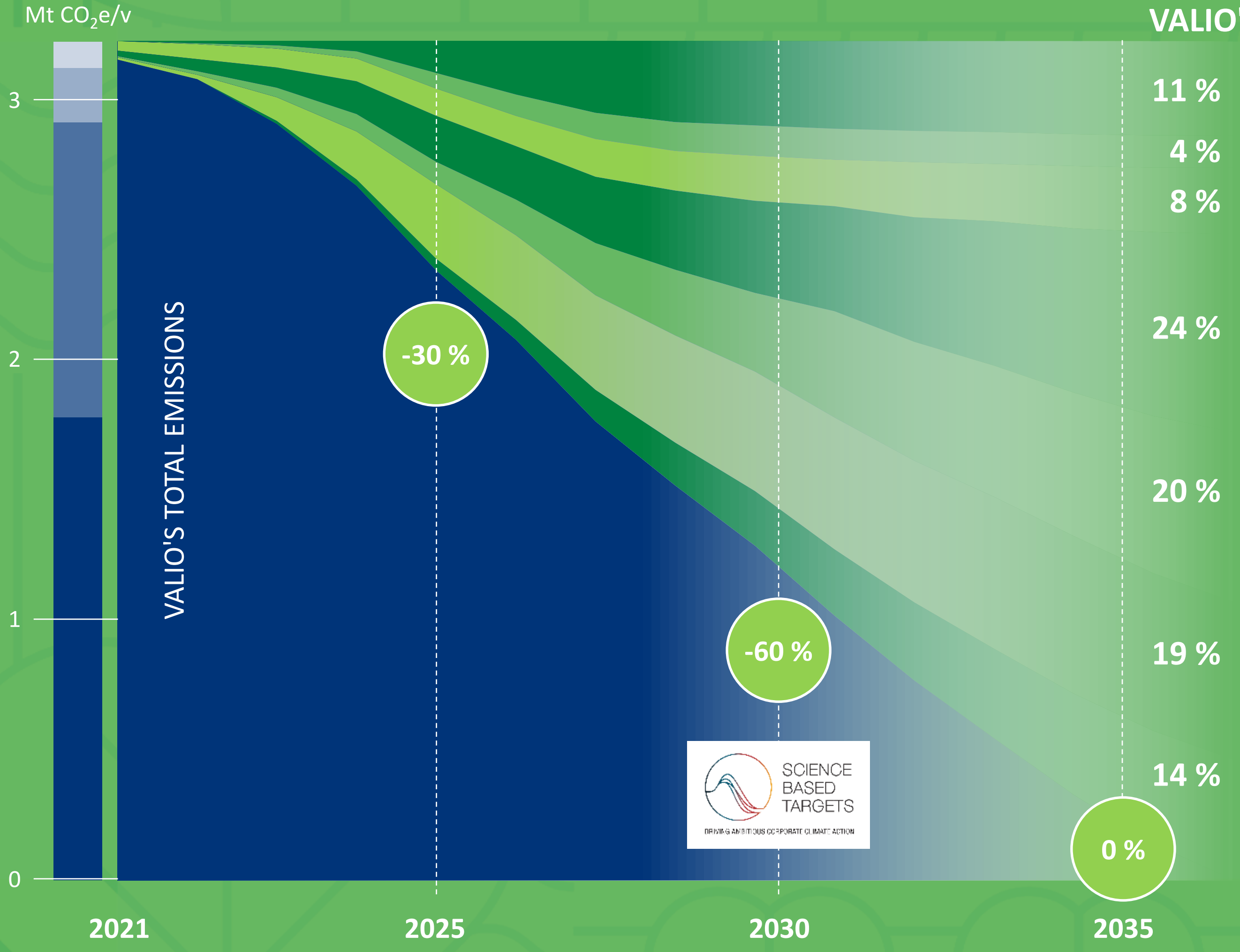
New emission reduction technologies

- 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_2e

- **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

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_4 EMISSIONS FROM MANURE MANAGEMENT

$$CH_{4\,Manure} = \sum_{(T)} \frac{\left(EF_{(T)} \bullet N_{(T)}\right)}{10^6}$$

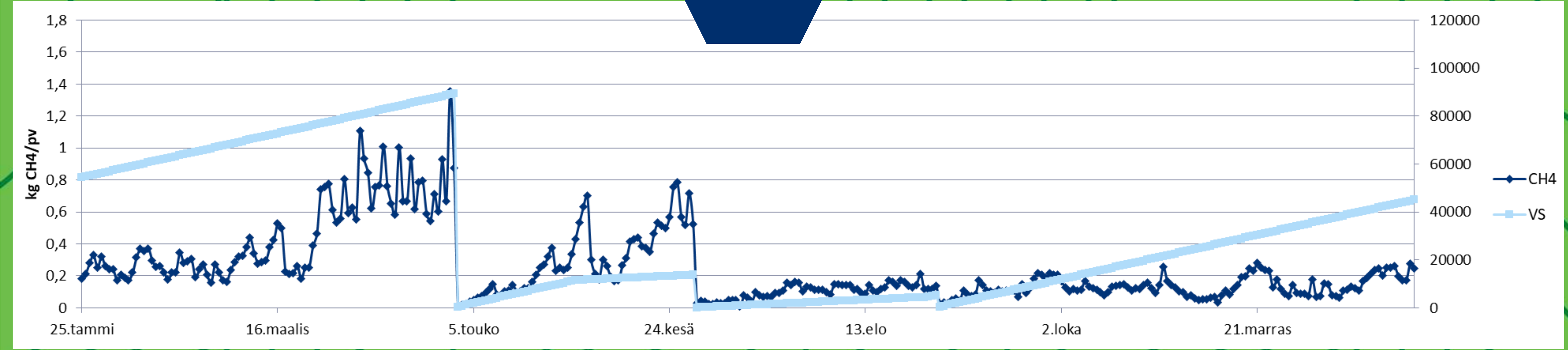
Tier 2

EQUATION 10.23

CH_4 EMISSION FACTOR FROM MANURE MANAGEMENT

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

Tier 3



Valio carbo

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 Astaptsev
Valio Ltd/ClimateSolutions

Development of Calculator

Nutrient Balance tool

Feed Optimiza-tion 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

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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

BIOGAS

BIO

SUSTAINABLE PURCHASES

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.

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

Uncertainties

- SCOPE & GOAL
- ALLOCATION
- CALCULATION ACCURACY
- DIFFERENT STANDARDS AND GUIDELINES
- CHARACTERI-ZATION FACTORS
- FUNCTIONAL UNITS
- SYSTEM BOUNDARIES

Many Results for Same Product

		Functional unit (kg CO_2e)							
		/kg ECM		/kg FPCM		/kg raw milk		/kg beef	
Allocation	CCFB	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.