

# 3. Showcase case explanation

**Valio's Climate Programme to reach carbon-neutral milk chain by 2035 with a special focus on biogas (VALIO – Finland)**



Co-funded by the Horizon 2020 programme  
of the European Union

Grant Agreement No. 101000519



# Main points we will cover:

1. Showcase story introduction
2. Value chain explanation
3. Governance and management
4. Facilities
5. Innovative business model
6. Relationship with primary producers



# 1. Showcase story introduction



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THE most  
*innovative*  
DAIRY  
IN THE WORLD - FROM  
FINLAND

FINNISH DAIRY  
FARMERS FOUNDED  
VALIO  
IN 1905  
to export butter.





FOR US—  
*milk is*  
**Amazing**

**DAIRY FARMERS  
ARE STILL  
VALIO'S OWNERS**

Valio pays out the profits  
through dairy cooperatives  
to 4,000 Finnish farms that  
own Valio.





**INNOVATIVENESS**  
*as*  
**A DRIVING  
FORCE**

## **NOBEL PRIZE WINNING INNOVATIONS**

The head of Valio's laboratories, A.I. Virtanen received the Nobel Prize in Chemistry in 1945. His legacy lives on at Valio. Valio uses science to make Food with a goal to improve everyday lives.



# Valio people around the world

## Valio Ltd (Finland)

Group headquarters: Helsinki

12 production plants around the country

## Valio Sweden

Headquarters: Stockholm



## ~~Valio Russia (withdrawn)~~

~~Headquarters: St. Petersburg~~

~~Production: Ershovo~~

## Valio Baltics

Headquarters: Tallinn

Production: Võru and Laeva



## Valio China

Headquarters: Shanghai



## Valio USA

Headquarters:  
Parsippany,  
New Jersey

## PERSONNEL (31 December 2019)

- Finland **3,152**
- Baltics (Estonia) **473**
- Sweden **57**
- USA **32**
- China **30**
- **Total 3744**

# Valio Group

THE *most* **innovative** DAIRY  
IN THE WORLD - FROM FINLAND

MILK THAT'S  
AMONG THE  
CLEANEST IN THE  
WORLD

FOUNDED IN  
**1905**

99% OWNED BY  
**5**  
COOPERATIVES  
(A TOTAL OF 13  
COOPERATIVES)

PROFITS FOR THE  
FARMS  
THROUGH MILK  
PRICE

**4,000**  
DAIRY FARMS

THE BIGGEST  
FOOD  
COMPANY IN  
FINLAND  
**80%**  
OF FINNISH  
MILK

**1.8**  
**BN**  
TURNOVER



NOBEL PRIZE

VALIO  
**117**  
YEARS

**3,150**  
EMPLOYEES IN  
FINLAND

**600**  
EMPLOYEES  
AROUND THE  
WORLD



**12+2**  
PLANTS IN FINLAND  
AND ABROAD



**1.8 BN**  
LITRES OF MILK  
PER YEAR



MARKET LEADER  
IN DAIRY  
PRODUCTS  
IN FINLAND



EXPORTS TO  
**60**  
COUNTRIES



VALIO AND ITS  
FARMS EMPLOY  
**30,000**  
PEOPLE

EU AVERAGE  
**BETTER MILK**  
PRICE TO FARMS



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## 2. Value chain explanation



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# Overall business idea 1/2

## Collecting and processing cow milk into a wide range of high-quality food products

- Valio's products are sold in 60 countries and account for 25% of Finland's total food exports.
- In addition to milk-based products, Valio's brands include Valio Oddlygood® with non-dairy vegan alternatives for milk, cheese and snacks.



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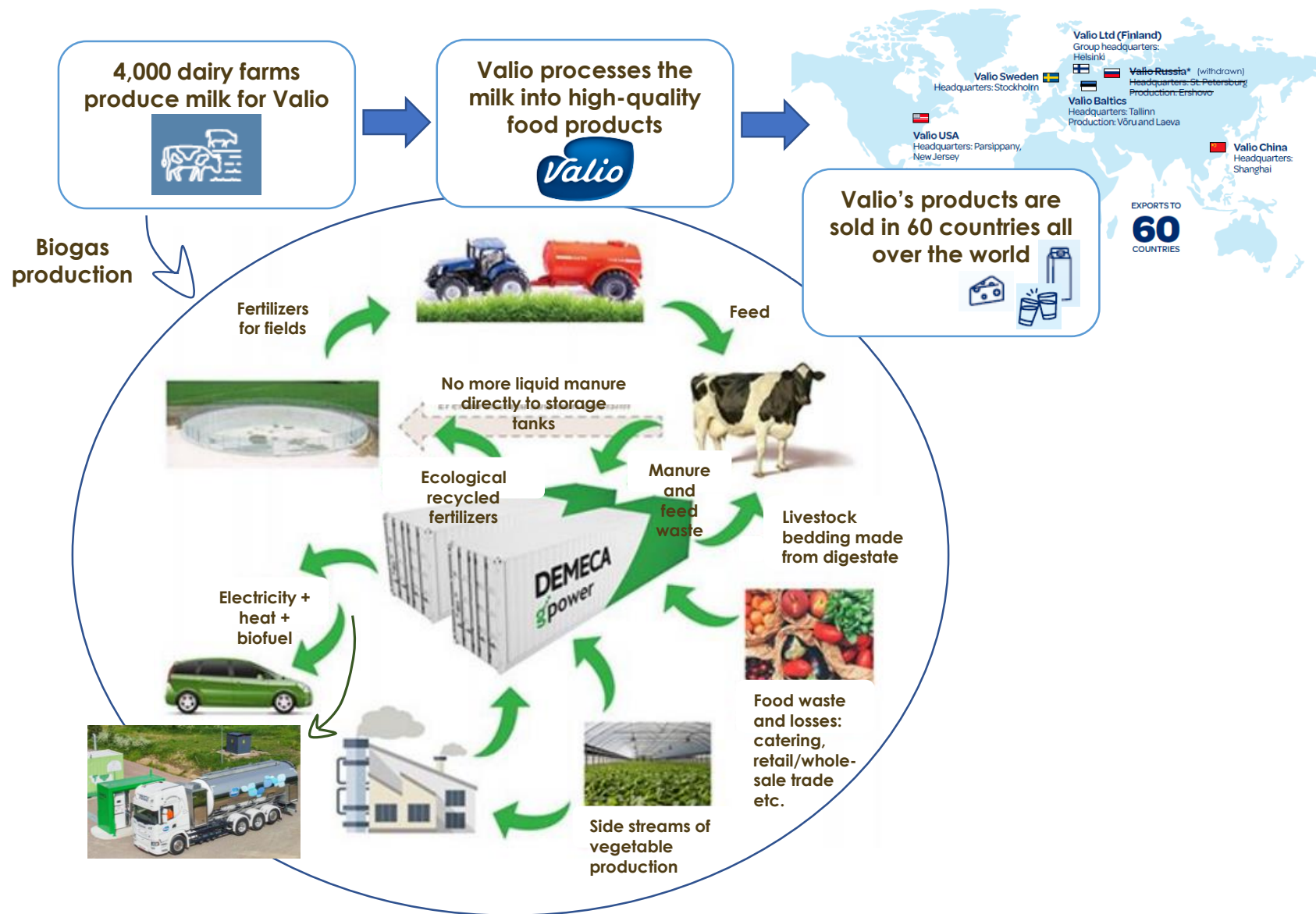
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# Overall business idea 2/2

## Circulating side streams to produce value

Biogas production is a major part of Valio's Climate Programme towards carbon-neutral milk chain by 2035



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# Biogas production as part of Valio's Climate Programme towards carbon-neutral milk chain by 2035 (1/2)

- **Circularity in terms of side stream utilisation is at the heart of Valio's operations:**
  - Valio processes the milk produced at the 4,000 farms into high-quality food products sold in 60 countries all over the world,
  - while the side streams of dairy production circulate to produce other end products and various benefits.
- **For example, at Vuorenmaa Dairy Farm:**
  - manure and feed waste are used as raw materials for biogas production to replace fossil fuels mainly in logistics of milk and distribution of products by trucks, but also in private car traffic.
  - In addition, the farm receives side streams of food processing companies to be used as raw materials for biogas production:
    - Farmers produce vegetables for the food processing companies residing close to Vuorenmaa Dairy Farm,
    - the food processing companies produce side streams such as peeling waste that is transported to Vuorenmaa Dairy Farm, and
    - Vuorenmaa Dairy Farm finally uses these side streams to produce biogas.



# Biogas production as part of Valio's Climate Programme towards carbon-neutral milk chain by 2035 (2/2)

## Other benefits of biogas production include:

1. mitigating manure storage emissions, as liquid manure is no longer stored at storage tanks,
2. the nutrient-rich digestate by-product to be used as recycled fertilizer in the fields where, for example, feeds for dairy production are produced, and
3. the potential to use biogas to replace also other uses of fossil energy in addition to logistics (e.g. for heat and power generation).



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# Key characteristics of the success story

1. Valorisation of manure, feed waste and food industry side streams for bioenergy
2. Upgrading of biogas to a biofuel for heavy transport
3. Circulation of nutrients and carbon back to the soils
4. Close cooperation between farms and processing industry
5. Financial support for biogas production





# 3. Governance and management

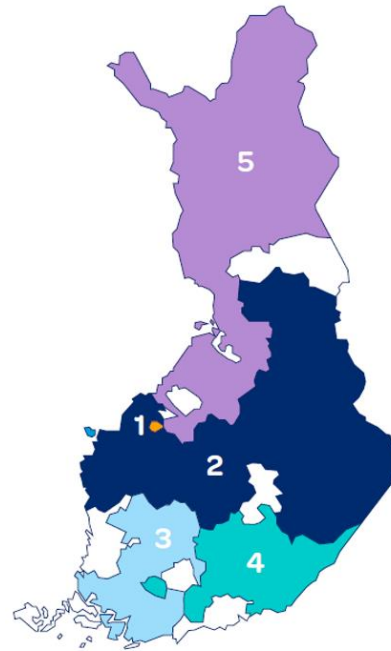
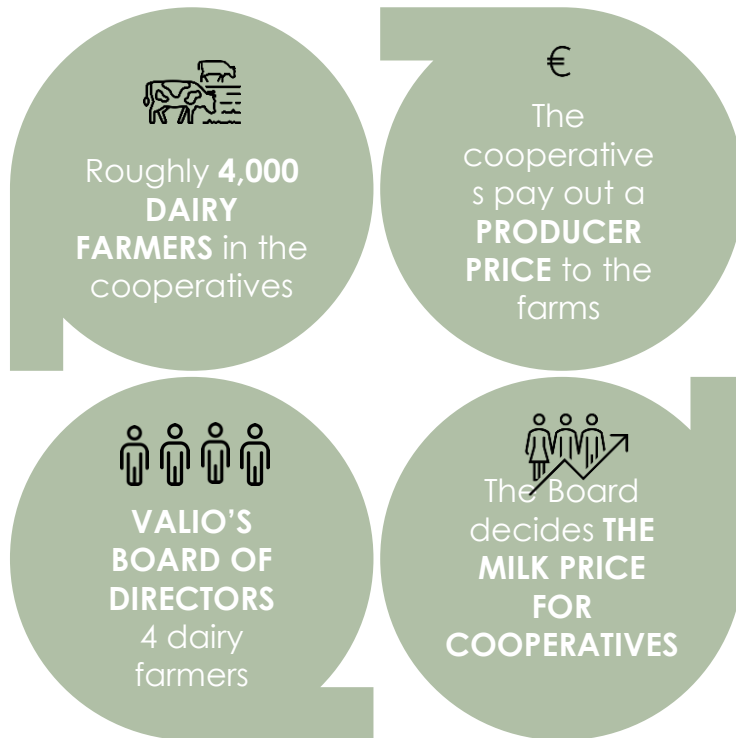


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# Owners, governance and management



Valio Group procurement cooperatives (supply milk to Valio, own 99% of Valio Group)	Other cooperatives owning Valio shares (Valio's competitors, own 1% of Valio Group)
1. Evijärven Osuusmeijeri	Hirvijärven Osuusmeijeri
2. Osuuskunta Maitosuomi	Hämeenlinnan Osuusmeijeri
3. Osuuskunta Länsi-Maito	Kaustisten Osuusmeijeri
4. Osuuskunta Tuottajain Maito	Kuusamon Osuusmeijeri
5. Osuuskunta Pohjolan Maito	Laaksojen Maitokunta
	Osuuskunta Maitokolmio
	Osuuskunta Maitomaa
	Osuuskunta Satamaito



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# Valio milk return composition and use





## 4. Facilities



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# Valio's production facilities

1. Valio operates its own plants in Finland and in Estonia. In addition to Estonia, Valio has subsidiaries in Sweden, China, and the United States.
2. In Finland, Valio operates a total of 12 production facilities. The different production facilities are specialised in high-quality production of different products.
3. In addition to dairies and cheese dairies, Valio operates a jam factory and a juice factory.



# 5. Innovative business model



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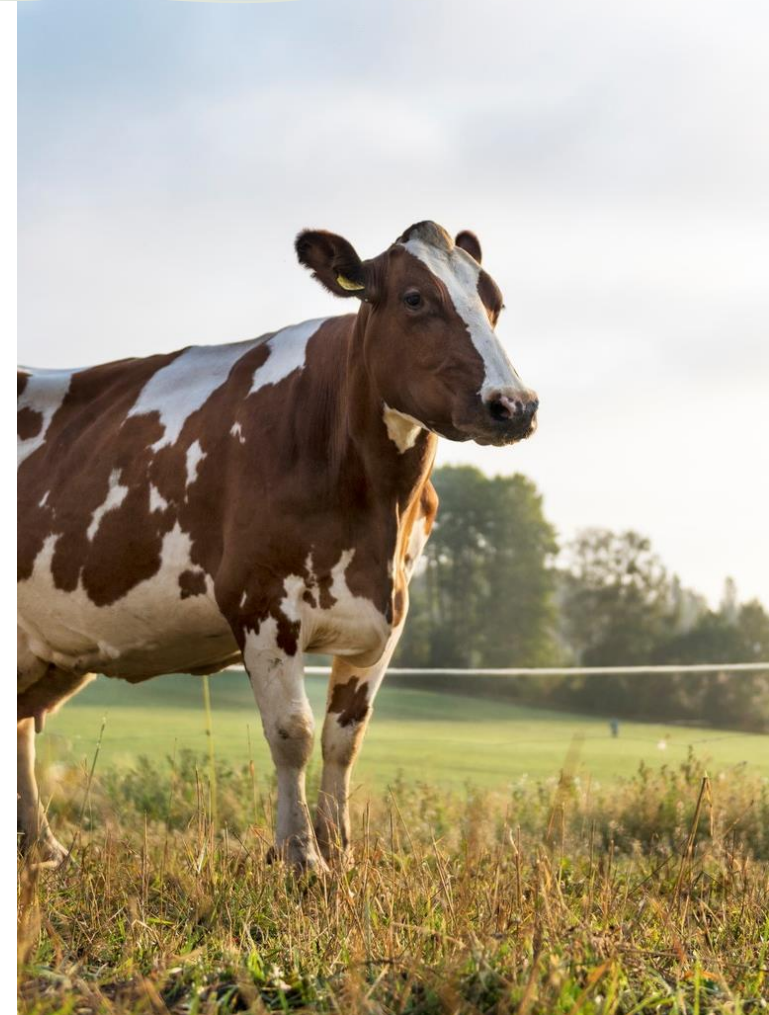


# Business model based on sustainable dairy production (1/14)

“Responsibility for the environment, the economy, people and society is embedded in everything we do.”



- Valio Group has a cooperative business model owned by a total of 13 cooperatives, including the five procurement cooperatives owned by Valio's farmers who supply the milk to Valio and own 99% of Valio Group.
- The cooperative approach provides economic and social sustainability benefits, as farmers profit from all stages of Valio's value chains, contributing to the viability of rural communities.
- Valio and its farms employ a total of 30,000 people, thus being a significant employer throughout Finland. Valio's 3,750 employees around the world enjoy the benefits of Valio's sustainability strategy, including varied activities aimed at employees' well-being.



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# Business model based on sustainable dairy production (2/14)



**"We want to do our part in solving global challenges."**

- In addition to direct impacts on Valio's employees and indirect impacts on people working on dairy farms and businesses related to Valio's operations (e.g. procurement and distribution), Valio's operations have indirect impacts on consumers.
- In the case of biogas production, the impacts on consumers are, at present, limited to people residing close to the farm where biogas is produced. In the future, the availability of biogas is extended significantly.
- As for Valio as a whole, its products are available in a total of 60 countries.



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# Business model based on sustainable dairy production (3/14)

TOWARDS  
**CARBON-  
NEUTRAL**  
*milk 2035*

Valio intends to cut milk's **carbon footprint** to zero by 2035

**Carbon-neutral milk means that** the same amount of emissions is reduced and removed from the atmosphere as is generated on the farms, in transportation, at the plants and in package manufacturing.



# Business model based on sustainable dairy production (4/14)

## SOY-FREE FEEDING SAVES RAINFORESTS

Compared to cows all around the world,  
our animals eat truly locally grown food.  
They do not eat soy, instead they are given  
grass feed and cereal.





# Business model based on sustainable dairy production (5/14)



## VALIO CARBO® FARM CALCULATOR: VALIO HELPS FARMERS TO LOWER THEIR CO2 EMISSIONS

- It is important to know what comprises milk carbon footprint so that we can act correctly.
- Valio developed a climate calculator tailored to Finnish dairy farms
- The methodology behind the tool is certified by global climate and sustainability experts, the Carbon Trust
- 1100 calculations by January 2022
- Farms calculate annually → we can see the development



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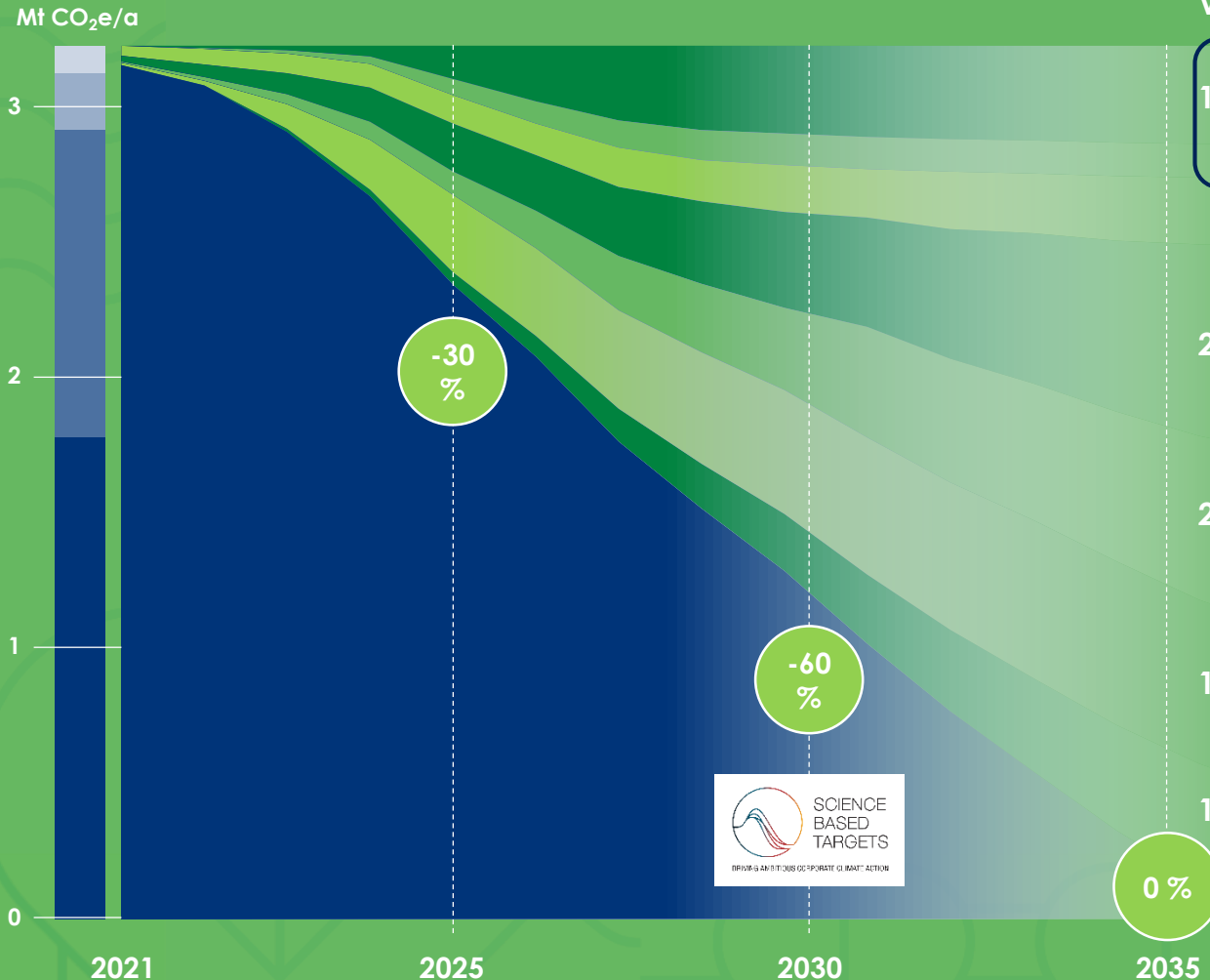
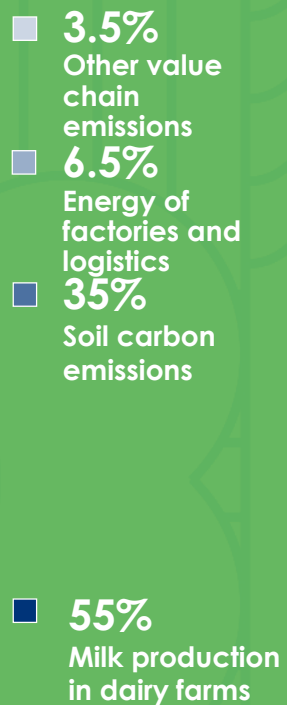
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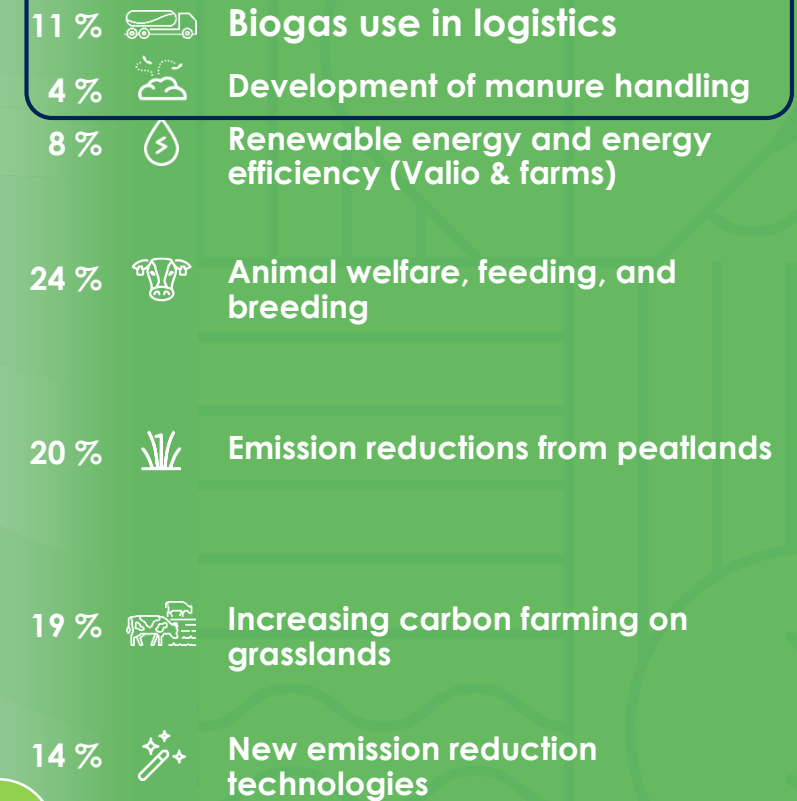
## VALIO'S CLIMATE PROGRAMME CARBON NEUTRAL MILK CHAIN BY 2035

VALIO FINLAND TOTAL EMISSIONS 2020

3.24 Mt CO<sub>2</sub>e



### VALIO'S ACTIONS TO REDUCE EMISSIONS



## 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**  
dairy 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

# Business model based on sustainable dairy production (8/14)

## VALIO HAS HALVED THE MILKING COWS' METHANE EMISSIONS IN 50 YEARS

- Methane volumes are lower per litre of milk: reasons for this are e.g. actions towards animal welfare and better feeding.
- Why is this? Cows' lifetime production of milk is higher and they use their feed more efficiently.
- The work continues, and Valio is involved in various scientific studies that continue to develop an environmentally friendlier cow (e.g. feed additives and animal welfare).



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# Biogas and milk's carbon footprint (9/14)

- Finnish milk's carbon footprint is roughly 1 kg CO<sub>2</sub>/kg ECM, and economically feasible emission reductions are not easily achieved in agriculture.
- **Biomethane production can mitigate milk's carbon footprint by 25 % due to:**
  - Impact on traffic sector emissions (4/5)
    - Biogas used as biomethane in heavy transport replacing fossil diesel → less emissions in the traffic sector
  - Impact on farm-level emissions (1/5)
    - Biogas production improves manure nutrients' availability to plants → less chemical fertilizers needed
    - Shorter periods of manure storage → smaller storage emissions
- **New revenue for feedstock producers**
  - Enhanced profitability of agriculture
- **Valio is also interested in using the biomethane in its own logistics**
  - Biogas is a cheap, renewable and domestic fuel that can be produced in Valio's own value chains
  - Lowered emissions from logistics
  - Valio's milk collection and product distribution consumption potential is roughly 160 GWh/a.



# Biogas at Valio today (10/14)

- **CBG – (compressed biogas)**
  - Upgraded and pressurized biogas (200-250 bars)
  - It is possible to produce CBG on farm-size biogas plants
  - Main challenges: demand and distribution (cars and light trucks)
- **LBG – (liquefied biogas)**
  - Upgraded biogas at -162°C
  - Requires bigger production capacity
  - LBG can be utilized in heavy road transports and maritime traffic
- **Valio's biogas fleet:**
  - LBG – four milk trucks
  - CBG – one milk truck and one product distribution truck
- **Valio has a total of 71 milk trucks (mostly diesel)**
  - Milk trucks have a high annual mileage (280,000 km/a).
    - Trucks are replaced with three-year intervals.
  - Two trucks are suitable for CBG (small sized).
  - The rest, a total of 69 trucks, would require LBG if they were biogas propelled.
  - Valio's logistics has a biogas potential of 160 GWh/a (16 million litres of diesel).
    - It is important to have secured consumption when ramping up the production.



# VALIO & ST1: towards large scale biogas production (11/14)



## Feed for the biogas plant

The joint venture is going to produce biogas from **farm manure, field biomasses** and **food industry waste streams (e.g. dairy)**

- Also non-Valio feedstock

The goal is that the farms become part of the production with ease and the production is economically viable for the farms as well.



## Production

The joint venture is aiming for 1 TWh production by 2030, an equivalent of ~100 mil. litres of diesel.

The joint venture is planning for a "hybrid production" combining traditional industrial-scale biogas production and smaller-scale scattered production.



## Utilisation

1 TWh is 1/4 of Finland's official goal for biogas production in 2030.

The biomethane will be distributed mainly from St1's heavy transport fuelling stations.

High biomethane utilisation is required in order for the 1 TWh production to be achieved.

- Production requires consumption.



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# Alternatives in the production methods (12/14)

- **Scattered production:** Approximately 1-5 GWh plant size. Plant on a singular dairy farm or in a co-operation. The product is most likely pressurized biogas (CBG).

+ Does not require expensive manure transportation  
- Low demand for CBG

- **Centrifed production:** Large-scale biogas production (>50 GWh) in an industrial biogas plant. The product is liquefied biogas (LBG).

+ Possibility to produce LBG and fertilisers  
- Demands expensive manure transportation

- **Hybrid production:** Combining scattered and centrifed biogas production. The product is LBG, but does not require as expensive manure transportation.

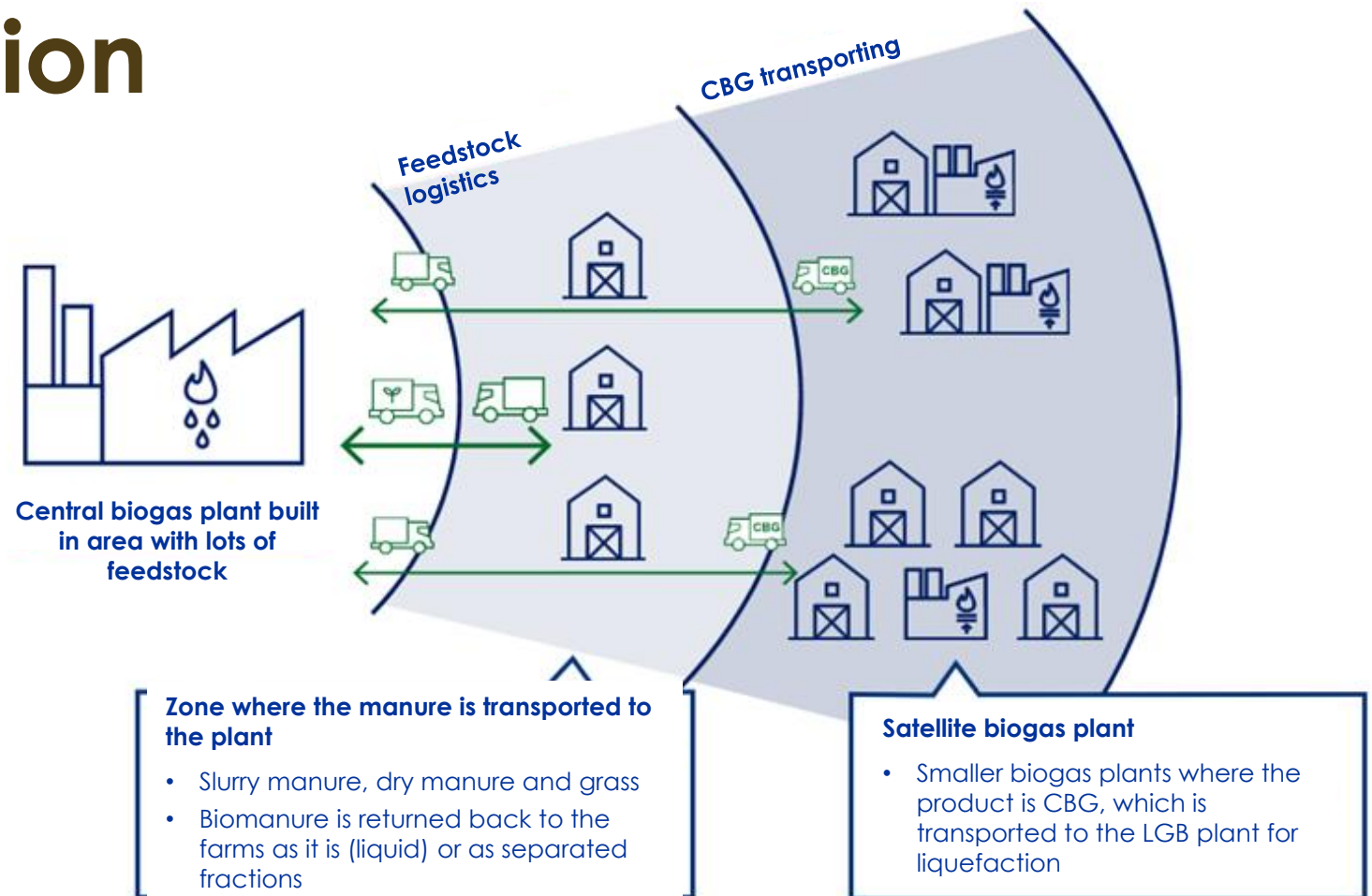
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# Three shades of biogas production (13/14)

TOWARDS  
**CARBON-NEUTRAL**  
*milk 2035*



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# Why biogas? (14/14)

1. Domestic renewable energy that is currently underutilized: also more affordable than diesel
2. Improves the profitability of agriculture: less fertilizers, logistical benefits and biogas sale profits
3. Enables nutrient circulation from food industry back to primary production
4. Positive impact on climate and the aquatic system
5. Tax incomes and work for rural regions



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## 6. Relationship with primary producers



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# Valio was founded and is owned by dairy farmers



Valio is owned by **13 regional dairy cooperatives** with around **4,000 farmer members**

All of Valio's operating **profits are paid to Finnish farms**

Valio's goal is to pay a **producer price** that is **at the level of the best cooperative dairies in Europe**. The price paid for milk has been higher than the EU average throughout the 2000s.



All the milk used to make the products in Finland is **sourced from Valio's Finnish farms**.

Valio pays a **sustainability bonus** to farms that are committed to **improving animal welfare**

Valio invests in their farmers' wellbeing and expertise: **Primary production services** related to e.g. milk quality, animal health and farm development are generally free of charge for their farmers. Valio also organises **training sessions on various topics**, including barn building, silage feed, animal welfare and financial management.



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# Valio's Board of Directors

1. The Board of Directors oversees the activities of Valio's operational management and business.
2. The Board of Directors has four members, all of whom are dairy farmers.
3. The Board members are part of the five cooperatives that supply milk to Valio.



**Vesa Kaunisto**  
Chairman

Farmer  
Veteli



**Pentti Suokannas**  
Vice Chairman

Farmer  
Askola



**Jarno Kämäräinen**

Farmer  
Kiuruvesi



**Sauli Lähteenmäki**

Farmer  
Rusko



# Role of other primary producers

1. A versatile range of raw materials can be used in the production of biogas.
2. In addition to manure and feed waste produced at dairy farms, **various other biomasses can be turned into biogas**, for example the side streams of vegetable production and processing.
3. **Cooperation between local farms and food processing companies** = a variety of side streams produced into biogas at farm-level biogas plants.

