

Producing Fresh Food in Extreme Climates

Lessons from Finland's Greenhouse Industry



REGIONAL COUNCIL
OF OSTROBOTHNIA



Co-funded by
the European Union



NOVIA
UNIVERSITY OF APPLIED SCIENCES

 **PTI**
AGROALIMENTOS
de **MAGALLANES**
Cooperación al desarrollo de la Producción

Comité Desarrollo Productivo
MAGALLANES
Y DE LA ANTÁRTICA CHILENA
por CORFO

Proyecto apoyado por
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 **eurochile**
FUNDACIÓN EMPRESARIAL

Short about me

- **Mr Peter Wiik, M.Sc Chem Eng.**
- Project Manager research at University of Applied Science, Novia, Finland.
- Head of 2-year project "*New Leaf for the greenhouse industry*" - identifying future technical solutions for heating, de-humidifying and lighting for Ostrobothnian greenhouses
- Technical and planning expert at vegetable producers co-operative Närpes Grönsaker
- 20 years of experience in process engineering, technology development from chemical industry
- Grandson of tomato and cucumber growers!

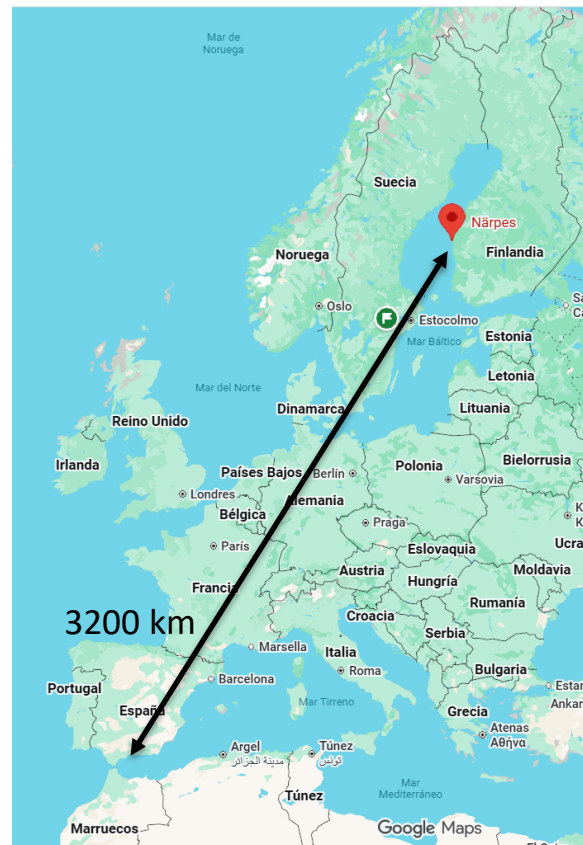


Comparison: Punta Arenas, Chile vs. Närpes, Finland



Punta Arenas, Chile	Parameter	Närpes, Finland
53.2° S	Latitude	62.5° N
ca +6.5°C	Mean annual temperature	ca +4.5°C
+11°C (summer)	Average January temperature	-6°C (winter)
+2°C (winter)	Average July temperature	+16°C (summer)
1,650–1,800 h	Annual sunshine	1,700–1,900 h
6–8 m/s, strong gusts	Mean wind speed	ca 3–5 m/s
Wind load	Main structural challenge	Snow load
Wind + cool temperatures	Main production challenge	Cold + lack of winter light

- We face similar challenges: **cold climate and short growing season**
- Far from big producers (Central Valley, Chile or Spain, Europe) → **need for local production**



100 years of greenhouse growing tradition in Närpes, Finland

Greenhouses in Närpes in year 1926 vs. 2026

- Närpes – "Tomato and cucumber"-capital of Finland
- 100 years of experience in producing vegetables in greenhouses
- 100 hectares of vegetable production in heated greenhouses (>50% of the total area in Finland)
- 50% of the greenhouses are year-around with supplemental lighting
- 60-70% of Finland's total production is from Närpes:
 - 25 million kg of tomatoes,
 - 35 million kg of cucumbers,
- World record high production yield:
 - Cucumber: production, 254 kg / m² year
 - Tomato: 101 kg/ m² year (40 weeks).
- Other crops in greenhouses: Peppers, lettuce, strawberries, raspberries, chilli and beans
- Provides Finland with **food security** by producing local, fresh vegetables all year around



”In a place where light disappears for months, cultivation has always required invention. First came the family greenhouse. Then the cooperative. Then artificial light. Now light itself is being designed as a moving strategy.”

- Mattis Nordström, 2nd generation grower in Närpes

Video: <https://www.priva.com/stories/m-nordstroem-ab>

Example of an all-year cucumber grower

Pictures: Närpes Grönsaker



4400 + 4400 m² block house

Glass roof and walls

Crop: Cucumber

HPS + LED lights

Central boiler

2 MW

Fuel: wood chips

Hot water tank
(heat storage)

1500 m²

Glass house

HPS

CO₂
tank

Example of an all-year cucumber grower

- Heating from water pipes: Floor + walls + in between plants + roof
- Plants in elevated grow bags with substrate
- Recovery of over flow irrigation water + circulation
- 3 rounds of plants per year
- Uses De-humidifier



Example of a season grower



Pictures: Närpes Grönsaker

- Greenhouses: 3 houses, 800 m² + 600 m² + 600 m², total 2000 m²
- Plastic covered traditional style houses
- Heating with 400 kW wood chips boiler -> 200 W/m²
- Crop: Red and yellow bell pepper, Flavorino beefsteak tomato



Example of a season grower



Pictures: Närpes Grönsaker

- Plactic covered floor
- Heating from water pipes:
Floor + walls + in between
- Plants in grow bags with
substrate on the ground
- Season: February –
October/November



Example of a season strawberry grower

- Greenhouses: 3 glass houses, total 2 900 m²
- Houses for tomatoes originally but not energy efficient enough anymore
- Falco strawberry, plants in Feb when outside Temp above 0 °C. Gives crop from May-end of June
- Crop yield about 0.5 kg/plant, 12 plants row / meter (10 plants / m²)
- House temperature
 - Day: Max 20°C
 - Night: 8-10°C
- Stonewool substrate



Example of a season strawberry grower

- Sells strawberry through own shop and to local super markets.
- Packs in 250 gram/box, price 5 €/box
- Packing by hand. Self-designed machine for putting stickers on boxes
- Also grow some raspberry but it requires much more labor for picking!
- Drip watering system for water and fertilizer.
- Invested in elevated beds. Keeps plants cleaner, saves time when picking, less mold problem!
- Cost (used) for elevated beds and drip water ~50 k€ for 1 500 m2.
- (fertilizer mixer from before when growing tomatoes)



Greenhouses

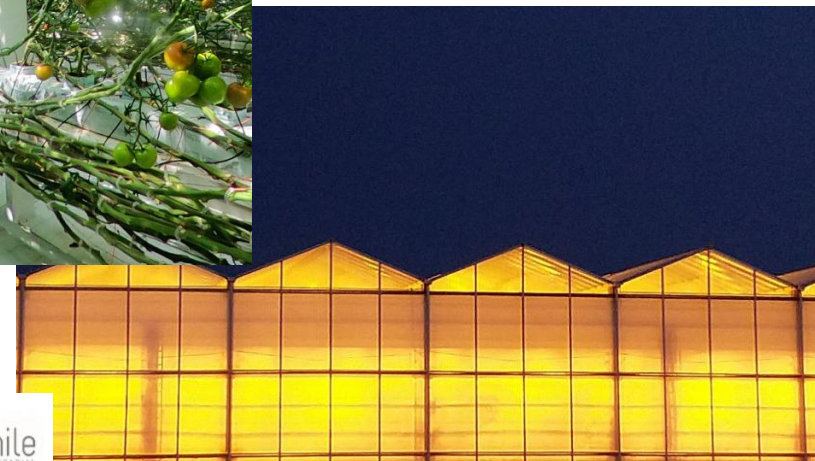
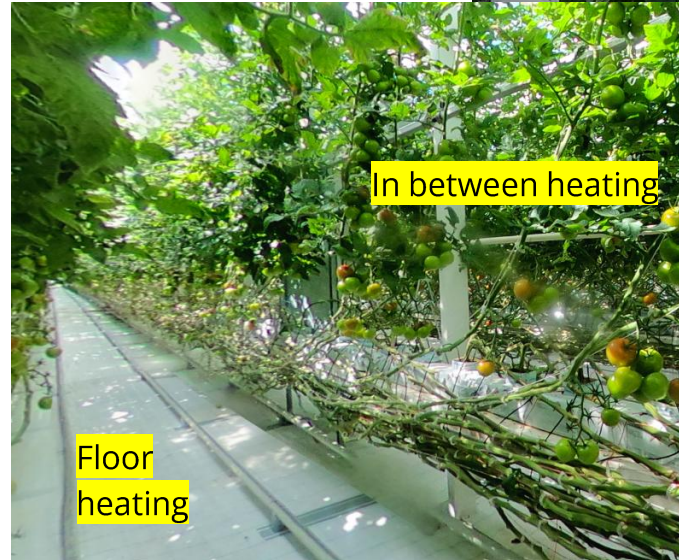
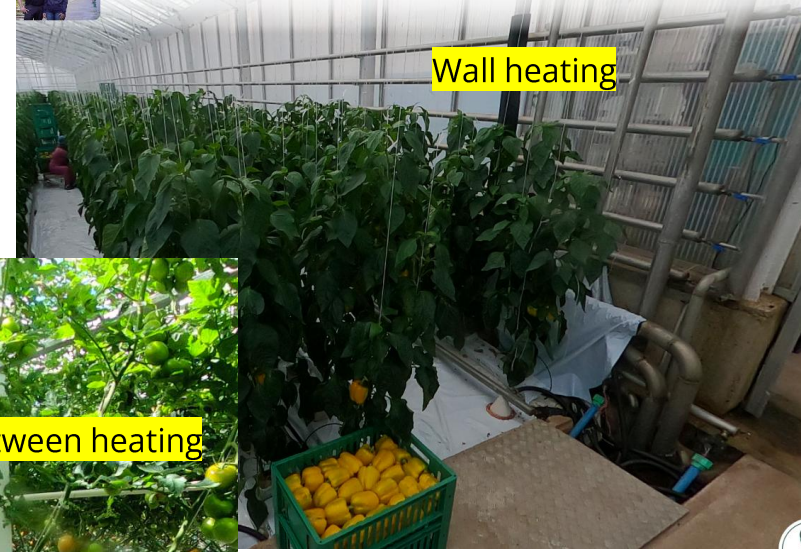
New build greenhouses are typically:

- Block house (5 000 m² / 10 000 m² per block), glass roof, plexiglass or glass walls
- Height to gutters: 5.5 – 7 meters
- Designed for snow load, BUT typically used in all-year round cultivation so no build up of snow on the roof
- Cost approx. 200 euro/m²



Heating

- Central heating, water pipes on floor (under plants), along walls and in between plants
- Temperature controlled by central climate control
- Heat from central boiler, typically wood chips but also electricity
- HPS lights provides lot of heat!



Lights

Pictures: Närpes Grönsaker

Top picture:

- Hybrid lights: HPS + LED roof ligths

Middle picture:

- LED grow lights (pink in between plants) + HPS in roof

Bottom picture:

- HPS ligths

Typically HPS is replaced with LED at the end of HPS lifetime. Big investment ca. 200 euro/m²!



De-humidifiers

Benefits:

- Less need for venting!
- Removes humidity from air without loss of heat or CO₂
- Investment typically 30 – 40 euro / m² (y. 2024)

Right picture:

- Nanea de-humidifier in tomato cultivation

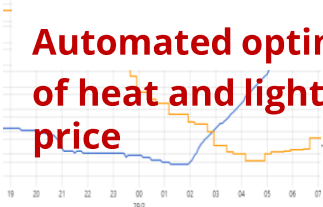
Left hand pictures:

- NW Systems de-humidifier



Greenhouse climate technology 2026

Automated optimization
of heat and lights on spot
price



FLEXIBLE
LED
LIGHT



Saving 30 % heat and
50% CO₂

Humid air

HEAT, CO₂

Water for
irrigation



De-humidifier by
NW Systems Ab Oy

FLEXIBLE
HEAT

HEAT,
CO₂

HEAT



Replacing
~50% of
the heat

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Co-operation between growers is a success factor

"If you want to go fast go alone, if you want to go far go together"

- Majority of growers in Närpes sells vegetables through co-operatives
- Co-operatives handles product logistics, packing, marketing and sales
- Common services, crop advisor, certification
- Strong knowledge sharing between growers in the co-operative
- Producer co-operating regarding supply (types of vegetables)
- Knowledge sharing between growers



Example of products from Närpes Grönsaker co-operative



Greenhouse eco-system of Närpes

Successful greenhouse industry takes more than greenhouses, it relies on an eco-system of specialized companies

- Plant propagators
- Greenhouse construction
- Heating and energy
- Climate technology
- Suppliers (equipment, fertilizers, biological crop protection)
- Crop advisors, logistics, banks
- BUT we have no specialized vegetable grower education, most is learned by doing or by training/courses e.g. in the Netherlands

Picture from the annual tomato festival in Närpes



Picture from the Greenhouse restaurant Lind's Kök in Närpes

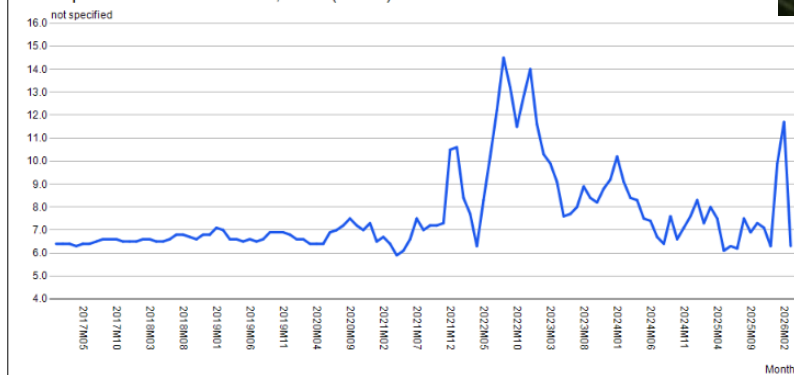
Challenges for greenhouses

Growers will constantly face challenges:

- Viruses / pests destroy crops
- Bad weather destroys infrastructure
- Energy and utility prices challenges profitability
- Technology development
- Politics / regulations
- Work force
- Competition

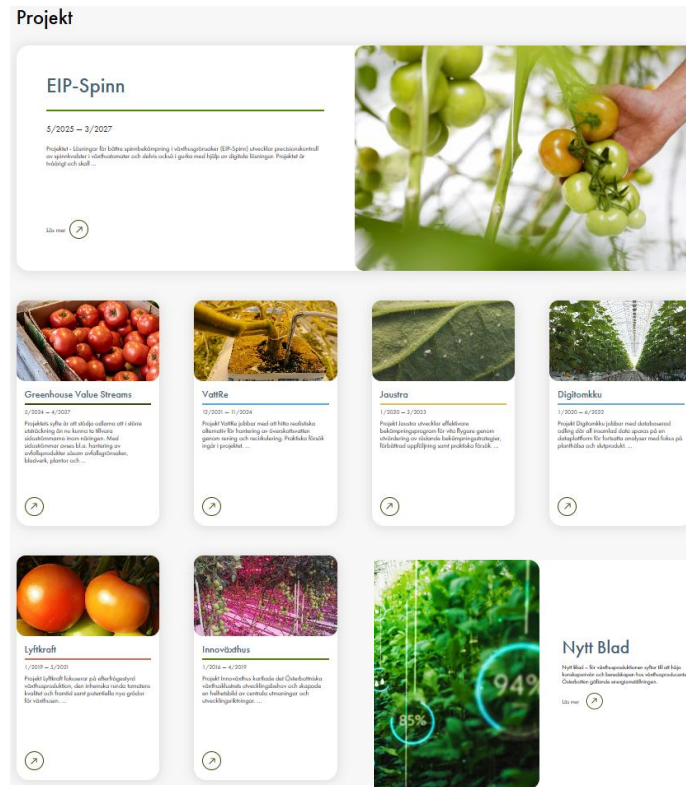


Price of electricity by type of consumer by Month. Enterprise and corporate clients, annual consumption 2 000 - 19 999 MWh, Price (c/kWh).



Knowledge / Research

- Knowledge of growing keeps you strong!
 - Example of development projects in Ostrobothnia, Finland. Funding from EU, Finnish government and local producers themselves.
 - Targets to produce knowledge that supports grovers. Focus on areas international research does not research, for example growing with artificial lights.
 - All greenhouse related projects gathered in one platform www.vakra.fi (in Swedish)



Project website www.vakra.fi
(in swedish but translate to spanish)

Gracias! Thank you!



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