

Sustainability of boreal, mixed crop and livestock farming under changing climatic conditions

Narasinha Shurpali and Several Luke Colleagues



Luke in brief



22 locations

1337 employees

133 M€ turnover

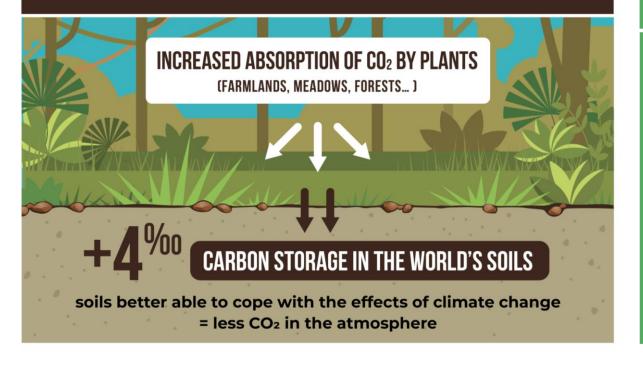






While pursuing the indispensible effort to decrease drastically the green house gases (GHG) emissions due to human activities, increasing soil organic carbon sequestration could make a substantial contribution to GHG mitigation efforts. A theoretical annual increase of the world

soil organic carbon stock by 0.4% of its value would be larger than the 2015 annual increase in CO₂ in the atmosphere, which is a major contributor to the greenhouse effect and climate change: this is the origin of the "4 per 1000" title of this initiative.



HOW CAN SOILS STORE MORE CARBON?

The more soil is covered, the richer it will be in organic material and therefore in carbon. Until now, the combat against global warming has largely focused on the protection and restoration of forests. In addition to forests, we must encourage more plant cover in all its forms.



Never leave soil bare and work it less, for example by using no-till methods



Introduce more intermediate crops, more row intercropping and more grass strips



Add to the hedges at field boundaries and develop agroforestry



Optimize pasture management with adapted grazing periods and rotations



Restore land in poor condition e.g. the world's arid and semi-arid regions



Improve water and fertilizers management and use organic fertilizers and compost Achieving climate neutrality

Sustainable transport

Clean, reliable and affordable energy

Financing the transition

Leave no one behind (Just Transition)

Towards a modernised and simplified CAP

Green Deal Going Local



The transformation of agriculture and rural areas

Preserving Europe's natural capital

Transition to a circular economy

A zero-pollution Europe

From farm to fork

A multidisciplenary team of scientists – agronomy, crop physiology, biogeochemistry, soil science and microbiology, animal sciences, statistics, modelling, digital technologies, socio-economy

































24.5.2022



Maaninka
North Savo region
Milk and Beef
Production – Second
largest producer in
Finland

866 dairy farms in the region

324.3 million L of milk in 2020

The research projects carried out at Luke Maaninka aim at

- Promoting sustainable and resource efficient grass production
- Strenghtening GHG,C sequestration and nutrient cycling research and providing excellent data for modelling
- Undertaking major Luke Agrifood (including Infratstructure) development projects in collaboaration with industrial partners and farmer organizations



Understanding the mechanisms behind the ecosystem sink for nitrous oxide (ENSINK)

Narasinha Shurpali, Hem Raj Bhattarai, Petra Manninen and Ville Nieminen

NUMA Luke Maaninka



Dairy and beef industries in Finland: Progressing pathways to carbon-neutrality by 2035 (NC-GRASS)





Nappaa Hiilestä Kiinni Program









Ministry of Agriculture and Forestry of Finland





HKSCAN





Current challenges Unsustainable Milk & Beef farms

NC-GRASS Outputs

NC-GRASS long term impacts:

Sustainable dairy and beef farms



Enhanced understanding of:

Organic and mineral Soils and their function, GHG exchange and nutrient cycling, Soil biodiversity & microorganism function, C, N, P nutrient losses







Models, tools, data & services:

Integrated Farming Systems Models, Remote sensing, Machine learning, GHG monitoring tools, Precision farming







Dissemination, exploitation & communication:

Stakeholder engagement, Reports and publications, Guidelines and policy briefs, Workshops and trainings, Handbooks & Mobile apps





LCA, socio-economy

Farm risk management



Biodiversity



Dynamic

emission factors



Decisions



Policymaking

Figure 1: Concepts of NC-GRASS as a living lab showing the current challenges, project outputs and its long-term impacts



RICH DATA SITES

RUUKKI - 2
MAANINKA - 3
Qvidja
Viikki
Jokioinen
Another mineral soil
site (recent - FMI)



Anttila – Collaborative Projects

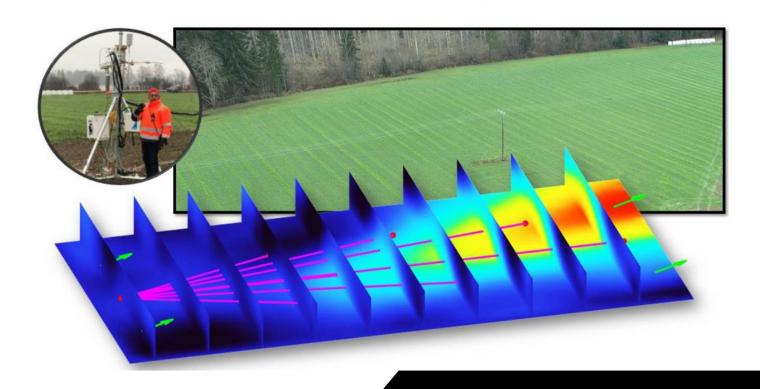
ENSINK (Academy of Finland)

NC-Grass (MMM - Luke, UEF, UH, FMI, MML)

ORMINURMI (MMM – Luke UEF)

Peltotomo (Pohjois-Savon liitto – UEF, Luke)

RehuDrooni (EAKR)

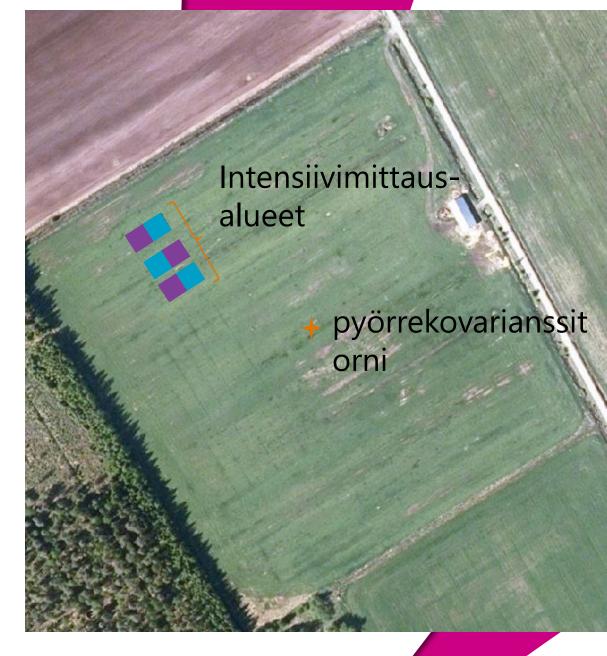




Pappilansuo

Current status

Organic soil
Eddy covariance and Chambers
To understand the impact of spring
Vs Autumn grass harvesting



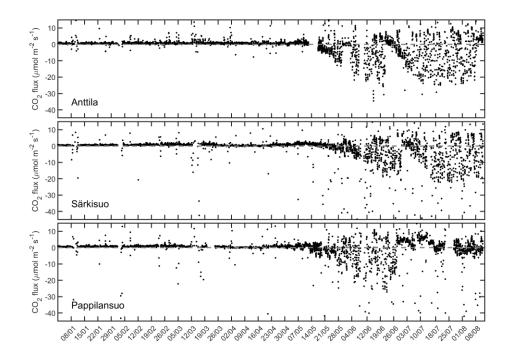


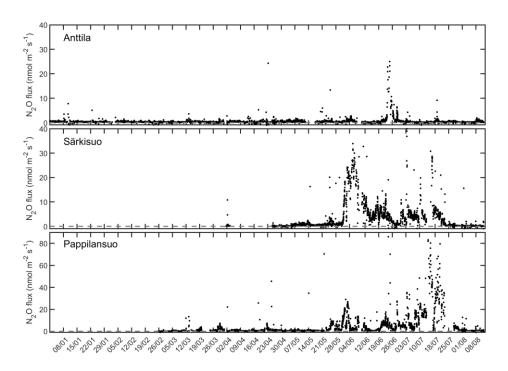
Särkisuo – Experiment

Peat soil site
manipulating water
table level, impact
on GHG
emissions, fodder
quality and
quantity for
animals

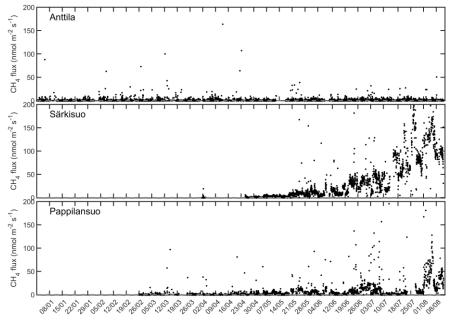
Current status







GHG measurements using eddy covariance technique from grasslands on mineral and organic soils in the Maaninka region



Measuremets help us in understanding the atmosphere – biosphere interactions and assist farmers with adopting best agricultural amanagement practices under changing climatic conditions.



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luke.fi

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