

trans4num INSPIRE Hackathon 2026

INNOVATION CANVAS

Team: Meguri

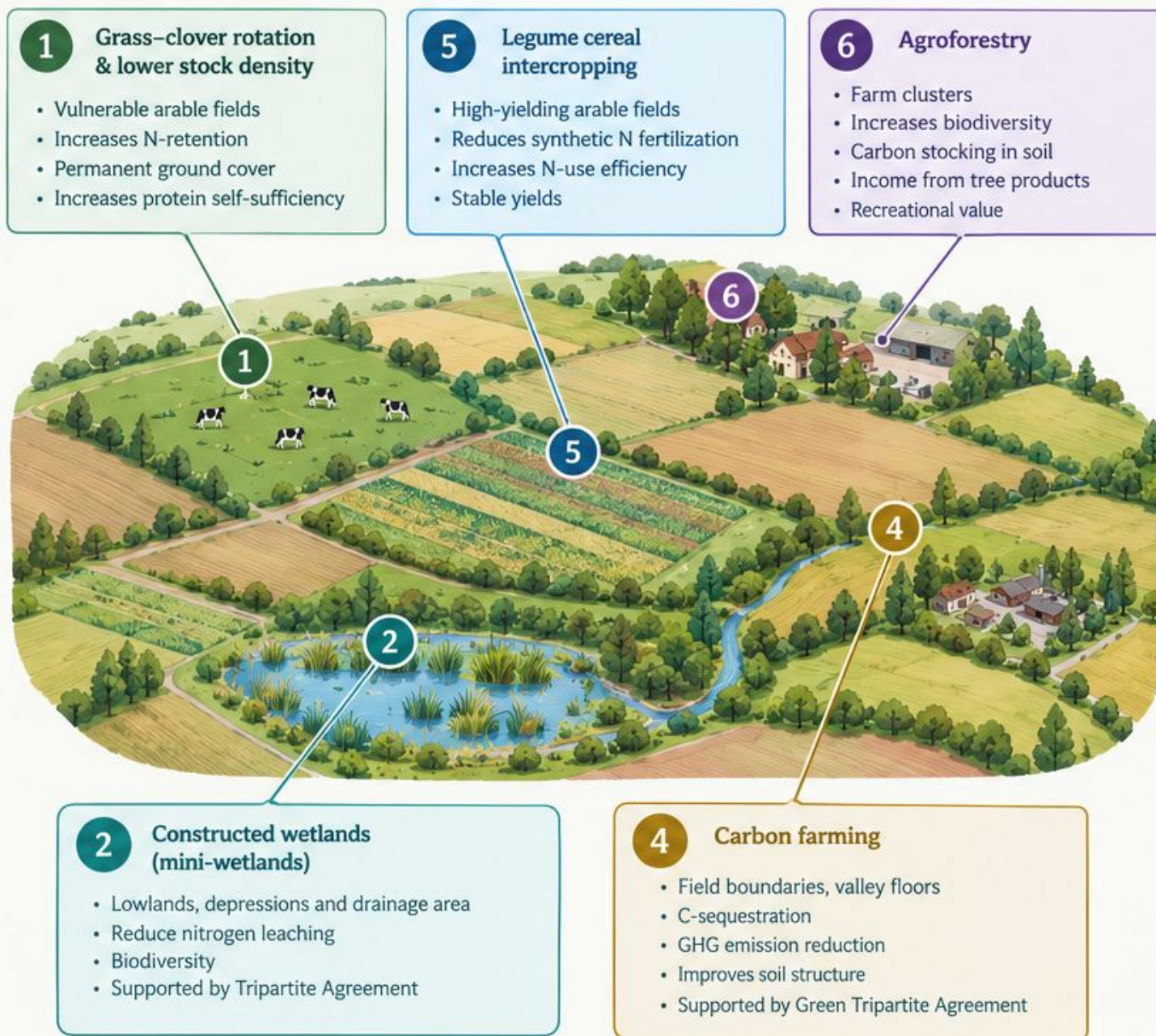
Team Members: Sofia Vila Verde (agronomist), Marie Nishino (agronomist), Komal Kumari (GIS Specialist),

Our solution in one sentence:

An integrated landscape-based approach that tackles nitrogen pollution at its source by combining smarter cropping systems, wetlands, and agroforestry to retain more nitrogen on farms, reduce emissions, and create long-term environmental and economic benefits for farmers.



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OUR INNOVATION IN ONE VIEW

1. THE PROBLEM

We want to solve...

Farmers face increasing pressure to reduce nitrogen losses, while maintaining their income and agricultural productivity.

2. THE SOLUTION

We propose...

A farmer-first landscape transition that combines targeted nature-based solutions with economic support to protect farmers' livelihoods.

3. THE BENEFIT

This will help because...

Reduce nitrogen pollution while maintaining food production competitiveness, rural livelihood fostering sustainable and resilient farming systems.

4. THE FARMER

Farmers will adopt it because...

Farmers can adopt sustainable practices without bearing the financial risks of environmental transition alone.

5. THE TRANSITION

To make it happen, we need...

Spatial planning, financial incentives, and cooperation between farmers, policymakers, and local industries.

1. THE PROBLEM

Main challenge

What specific primary problem in the Limfjord catchment does the solution target? *(e.g., severe nitrate leaching on sandy soils, dependency on imported feed proteins, continuous emissions from drained peat soils)*

Farmers face increasing pressure to reduce nitrogen losses while maintaining agricultural productivity and economic stability. Environmental measures may increase costs, reduce productive land, and threaten farm profitability.

Why is this important?

If farmers cannot remain economically viable, the transition to sustainable agriculture will not succeed. We need solutions that protect farmers' livelihoods while restoring the Limfjord ecosystem.

Who is most directly affected by this challenge?

☐ Farmers

☒ Municipalities

☐ Limfjord Water Ecosystem

☐ Downstream Bio-industries

2. THE SOLUTION

Nature-based solutions

Measure / Element	Landscape placement	Core function (N-retention, biodiversity, carbon, feed)
1 Grass-Clover rotation & lower stock density	Vulnerable arable fields susceptible to leaching	Increasing N-retention, permanent ground cover, increase protein self-sufficiency
2 Constructed wetlands (mini -wetlands)	lowlands depressions and drainage area	Reduce nitrogen leaching, biodiversity, supported through the Tripartite Agreement eco-scheme
3. Carbon Farming	field boundaries, valley floors	C-sequestration, GHG emission reduction, economic incentive, improves soil structure supported through eco-scheme under the Green Tripartite Agreement
4.. Legume cereal intercropping	arable field with highest yields	reduce synthetic N fertilization while ensuring stable yeilds; increase the nitrogen use efficiency
6. Agroforestry	Farm Clusters	Increase biodiversity and carbon stocking in the soil. Farmers can get money by selling trees; recreational purpose.

2. THE SOLUTION

Nature-based solutions

How do these measures function together as an interconnected system?

By ensuring that while meeting the Green Tripartite Agreement Goal, the farmer can still maintain his farmer for the future generations while reducing N leaching. By doing so, we can ensure that we care for the Limfjord while caring for the farmers and the future.

3. THE BENEFITS

Expected impacts & Trade-offs

Anticipated multi-benefits:

Nitrogen reduction: Legumes reduce fertilizer needs through N fixation; wetlands remove nitrate through denitrification

Biodiversity enhancement: Increasing local fauna and local flora, pollinators activity through agroforestry and wetlands

Climate & Soil health (C-Sequestration / GHG cuts): Trees absorb CO₂ and store carbon in biomass and potentially in soil.

Farm economics & Income: Optimize livestock density and land use to reduce fertilizer and imported feed inputs, lowering production costs. Generate additional income from timber and other agroforestry products.

3. THE BENEFITS

Expected impacts & Trade-offs

Identified Trade-Off or Bottleneck: *(e.g., reduction in cereal acreage, upfront processing facility costs, temporary yield adjustments)*

Possible reduction in cereal production and yield stability

Adjust farmers perception of its farm profitability

Need for new knowledge and farming skills to run a diverse cropping-system

How does your design mitigate or manage this trade-off?

Support farmers to learn how to reduce the financial risk

participatory farmer-center approach

Bottom-up approach through farmer involvement

4. THE FARMER

Farmer adoption & Business case

Why would a local farmer actively adopt this solution?

- ☒ [X] New commercial income streams (*e.g., green biorefinery protein, biogas feedstock*)
- ☒ [X] Reduced expenditure on synthetic fertilizers and imported protein feed
- ☐ [] Compliance with tight national nitrogen quotas and EU Water Framework Directive mandates
- ☒ [X] CAP subsidy eligibility (*e.g., eco-schemes, agri-environment-climate commitments, wetland support*)

What is the single biggest barrier to farmer adoption, and how do you overcome it?

Initial investment required for the implementation of NBs, ideally overcome through simplified financial support and streamlined procedures

5. THE TRANSITION

Role of digital tools & Spatial evidence

How did the available tools and data inform your design choices?

Jackdaw GeoAI Platform:

Could help visualize spatial differences in nitrogen loss risks and identify suitable locations for nature-based solutions.

Decision Support Tool (DST) / Regional Spatial Data:

Could help farmers compare farming practices and explore how changes in management may affect nitrogen losses.

5. THE TRANSITION

Key innovation & Strategic recommendations

Top 3 action steps to enable implementation:

Farm / Advisory level:

Provide training and technical support for farmers and monitor nitrogen production to optimize farm management.

Regional / Market level (biorefineries, processing hubs, farmer cooperatives):

Open dialogues with local tripartides. Strengthen local supply-chain

Policy / Regulatory level (targeted subsidies, eemitting, land consolidation):

Bottom up approaches, targeted subsidies for younger farmers and small farm-holders. Increase the compensation for forest implementation

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Q&A

Discussion

A Farmer-First Landscape Transition for Reducing Nitrogen Pollution

1. THE PROBLEM

Farmers face increasing pressure to reduce nitrogen losses to water and the atmosphere while maintaining agricultural productivity, profitability, and rural livelihoods. This challenge is particularly acute in vulnerable landscapes, such as sandy soils and low-lying agricultural areas, where nitrate leaching can be high. However, reducing nitrogen pollution cannot rely on individual farmers bearing the costs and risks of environmental transition alone.

2. THE SOLUTION

A farmer-first landscape transition that combines targeted nature-based solutions (NbS) with economic support and participatory planning. Different measures are placed where they can deliver the greatest benefits: grass–clover rotations and lower livestock density on vulnerable fields; constructed mini-wetlands in low-lying areas and drainage zones; cereal–legume intercropping on productive arable land to improve nitrogen-use efficiency and reduce synthetic fertiliser requirements; carbon farming along field boundaries and valley floors; and agroforestry around farm clusters. Together, these measures aim to retain nitrogen, reduce emissions, restore biodiversity, improve soil health, and diversify farm income.

3. THE BENEFIT

An integrated landscape approach addresses nitrogen pollution at its sources while maintaining productive agricultural systems. Combining measures across fields, farm boundaries, and drainage areas can generate complementary benefits, including lower nitrogen losses, improved biodiversity, carbon sequestration, more efficient nutrient use, and greater protein self-sufficiency. By coordinating interventions across the landscape, the project seeks to strengthen farm resilience, maintain food-production competitiveness, and support viable rural communities.

4. THE FARMER

Successful adoption depends on making the transition economically viable, technically feasible, and socially acceptable. Farmers should not be expected to bear the financial risks of environmental improvements alone. Targeted payments, carbon-farming incentives, and relevant agricultural eco-schemes can help compensate for costs and potential income losses. Participatory design, farmer-to-farmer knowledge exchange, and tailored training can strengthen trust, build the competencies needed to manage diversified cropping systems, and ensure that solutions reflect farmers' experiences, priorities, and perceptions of profitability.

5. THE TRANSITION

A coordinated framework connecting spatial planning, financial incentives, agricultural knowledge, and local cooperation. Landscape-level assessment can identify where each intervention is most effective, while collaboration among farmers, researchers, policymakers, agricultural advisers, and local industries can align environmental objectives with production and market opportunities. Existing policy instruments, including relevant elements of Denmark's Green Tripartite Agreement, can support implementation. Monitoring nitrogen losses, greenhouse gas emissions, biodiversity, and farm-level economic performance will help evaluate outcomes and adapt management over time.