USING MODELLING TOOLS TO SUPPORT BETTER FARMING AND POLICY DECISIONS

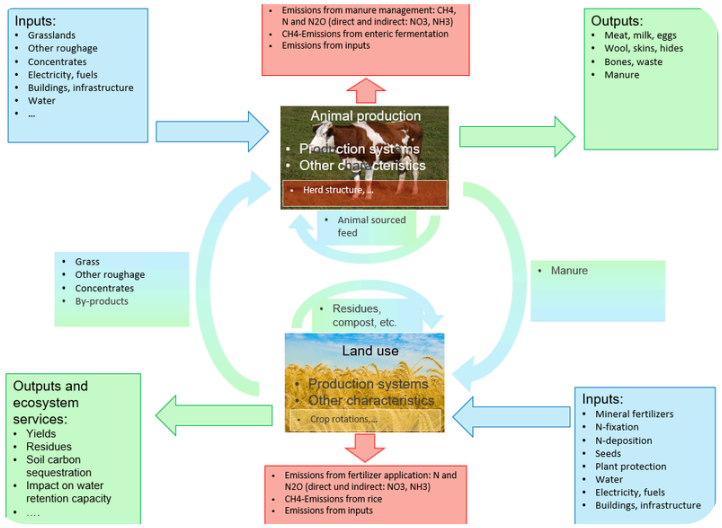
Summary

Nature-based Solutions (NBS) often require farmers and policymakers to make complex decisions involving environmental, economic, and social trade-offs. Within trans4num, a suite of complementary modelling tools was developed to support these decisions by exploring different future scenarios before actions are implemented. By combining Decision Support Tools (DST), Agent-Based Models (ABM), and Food System Models (FSM), stakeholders can evaluate the potential impacts of management practices and policy options, helping to reduce uncertainty and support more informed, evidence-based decision-making

The need

Farmers and policymakers need better ways to plan the transition to more sustainable agriculture. Decisions about nature-based solutions (NBS) are complex and involve trade-offs between productivity, environment, and costs.

However, many tools are too technical or poorly adapted to real-life decision-making. There is a need for models that reflect real-world conditions throughout the entire value chain, yet are sufficiently simple enough to provide farmers and policymakers with a clear, easy-to-interpret basis for decision-making.



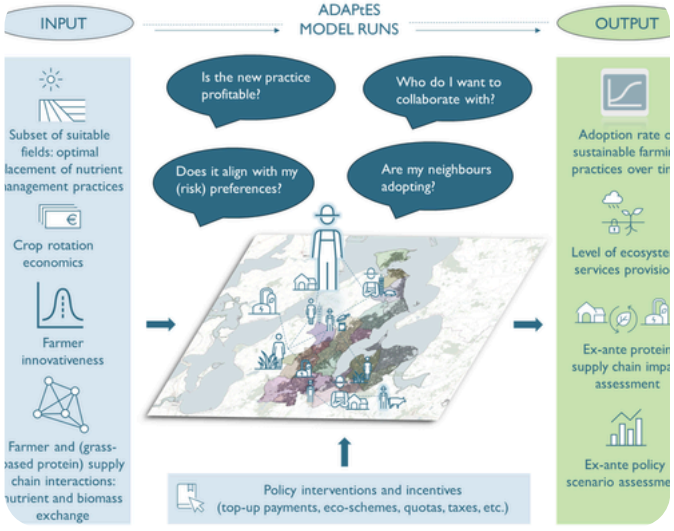
The benefits

Well-designed modelling tools help stakeholders understand future impacts before acting. They allow **farmers, advisors, and policymakers** to test different options, reduce risks, and make more informed decisions. This leads to better targeted policies, more effective incentives, and higher adoption of sustainable practices.

The models successfully help answer practical questions such as:

- What happens if new nitrogen policies are introduced?
- What if nature-based solutions are scaled up?
- What are the trade-offs between production, environment, and costs?

Early model applications (e.g. Danish ABM prototype) demonstrate the ability to show impacts on farmer behaviour, profitability, and environmental outcomes, supporting more realistic policy design. Stakeholder feedback highlighted that models must be easy to understand and transparent, otherwise they risk being seen as “black boxes” and not used.



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trans4num solution

trans4num used three types of models for supporting the decision-making process:

- Decision Support Tool (DST): This explores how the spatial allocation of NBS practices can be optimized to reduce environmental impacts, improve ecological performance, and support agricultural productivity while balancing economic constraints across multiple spatial scales.
- Agent-Based Models (ABM): These simulate how farmers make decisions in real life, considering factors like costs, social influence, and policy incentives
- Food System Models (FSM): These explore how changes in farming practices and commodity processing and use affect food production, nutrient flows, and the environment at regional and national level

These tools were developed and tested together with stakeholders to ensure they are relevant, understandable, and useful in practice. They help answer "what if" questions before policies or investments are implemented and foster dialogue between different levels of stakeholders. Workshops with policymakers, advisors, and experts showed that models are more useful when developed together with users, ensuring they reflect real farming conditions, policies, and constraints and address the question of interest for various stakeholder groups.

What were the challenges / limitations in the implementation process?

- Models can be complex and difficult to understand and use without expert support (researchers and/or advisors)
- Results may not be trusted if tools appear as "black boxes"
- Differences between research timelines and policy needs can limit use
- Lack of data, incentives, or supportive policies can reduce real-world impact

What kind of resources do you need to implement the proposed solution?

- Skilled facilitators: experts who can explain results and guide discussions (reserachers and/or advisors)
- Stakeholder involvement: policymakers, advisors, and farmers engaged early
- Good data: reliable local and national data to improve model accuracy
- Balanced investment: equal focus on research, stakeholder engagement, and capacity building
- Intermediaries: organisations that connect science, policy, and practice

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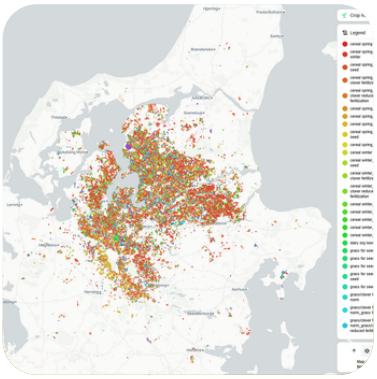
More information

- Learn more about trans4num
- Explore the trans4num Decision support tool
- Explore more Practice Abstracts: https://trans4num.eu/library/?type=ABS



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Learn more about the project at https://trans4num.eu/en/

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