FACTSHEET NO. 5

NUTRI-CHECK NET
OPTIMISING CROP NUTRITION

ARVALIS

Review Phase: Evaluating Nutrient Management at farmer scale with Decision Support Systems (DSS)

Applicability box

Geographical coverage
France (National deployment)
EU relevance

Application period
Post season review

Required time
2-4 hours per farm

Period of impact
Annual to multi-year

Equipment
Farm records, computer, internet access

Problem

Nutrient management is a complex task that involves balancing crop needs, soil fertility, environmental constraints, and economic viability. While pre-season planning is essential, it often lacks the flexibility to adapt to in-season variability and long-term sustainability goals. After implementing a nutrient management strategy, it is essential to evaluate its effectiveness. However, many farmers and advisors lack tools that provide a comprehensive view of performance across agronomic, economic, and environmental dimensions.

Farmers and advisors need tools that allow them to evaluate past fertilization strategies, simulate alternatives, and plan improvements based on multiple performance criteria.

Without structured evaluation, it's difficult to:

- Identify inefficiencies or unintended impacts
- Quantify nutrient losses (e.g. volatilization, leaching)
- Improve future fertilization plans

Solution

Reviewing nutrient management means going beyond simple yield or input cost analysis. It involves assessing the multi-dimensional performance of fertilization strategies, including:

- Agronomic performance: Yield, nutrient use efficiency, crop quality
- Environmental impact: Nitrate leaching, GHG emissions, soil health
- Economic viability: Input costs, margins, return on investment
- Operational feasibility: Labor time, equipment use, intervention frequency

This approach is aligned with the agroecological transition, which requires systemic thinking and long-term planning.

Multi-criteria evaluation tools like SYSTERRE® and Syst'N offer structured frameworks to assess nutrient management outcomes using Key Performance Indicators (KPIs) and Decision Support Systems (DSS). They can be used: Ex□post: to evaluate past seasons; Ex-ante: to plan future strategies and Iteratively: to support continuous improvement.

SYSTERRE® (ARVALIS) is a farm-level DSS that evaluates cropping systems using 20+ core indicators. It covers technical, economic, environmental, and operational dimensions. It enables scenario comparison and strategic planning.

Syst'N (INRAE) is a scientific tool focused on nitrogen flows and losses. The tool simulates nitrogen dynamics at plot and farm scale, and it estimates emissions (e.g. NH_3, N_2O), leaching, and NUE.

Decision Support Systems like SYSTERRE® and Syst'N:

- Provide indicators for assessing nutrient losses (volatilization, leaching)
- Support decision-making through economic and environmental analysis
- Offer expert advice on interpreting results and identifying improvement strategies

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Outcome

By using these tools in the Review Phase, practitioners can improve benefits in several dimensions:

- Quantify the success of their nutrient strategy
- Evidence-based decision-making
- Identify areas for improvement
- Enhanced farmer-advisor dialogue
- Improved transparency and traceability
- Adjust future plans to enhance resilience, efficiency, and sustainability
- Support for certification and eco-scheme eligibility

Practical

Main recommendation:

Use DDS like SYSTERRE® (www.systerre.fr) and/or Syst'N at the end of the cropping season to evaluate the performance of nitrogen management strategies. These tools help translate raw data into actionable insights.

Added value for the end-user:

- Evidence-based decisions for future planning
- Compliance support for environmental regulations
- Improved profitability and sustainability
- Benchmarking against reference scenarios

Implementationi tips:

- Start with basic farm data: crop rotation, inputs, yields, soil tests
- Choose a tool adapted to your region, crop type, and goals
- Use DSS outputs to guide discussions, not replace expertise
- Combine with field observations and sensor data for richer insights

Further information

This multi-criteria evaluation approach is being validated through European research initiatives such as NUTRIBUDGET, Strate-GEEK (SmartAgriHubs), Farmtopia, DiverIMPACTS, EU-Rotate_N. which explore the integration of crop modeling, sensor data, and sustainability indicators. These projects contribute to the development of robust Decision Support Systems (DSS) for revising fertilization strategies and assessing system performance.

These projects contribute to:

- *Scientific validation of multi-criteria evaluation frameworks.*
- *Operational deployment of DSS tools in real farm contexts.*
- *Integration of sustainability indicators (economic, environmental, social).*

The approach supports:

- *Commercial valorization of digital agronomic services.*
- *Agroecological transition strategies, by enabling low-input, high-efficiency systems.*
- *Strategic farm planning, through scenario testing and performance benchmarking.*

It is compatible with:

- *CAP eco-schemes: Precision farming is listed among eligible practices, including digital and smart agriculture solutions such as variable-rate technologies and nutrient sensing systems.*
- *Digital farm management platforms: SYSTERRE can interface with traceability tools and farm data systems.*
- *Sensor integration and modeling frameworks: The tool supports the use of crop growth models and in-field diagnostics to refine nitrogen management decisions.*

About this factsheet

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NUTRI-CHECK NET is a Horizon Europe multi-actor project establishing a self-sustaining, multi-actor, Thematic Network called “NUTRI-CHECK NET” that builds farm-level adoption of best field-specific
nutrient management practices across Europe. In nine countries, farmers’ Crop Nutrition Clubs will identify and share the nature of their uncertainties about crop nutrition, their challenges and barriers to change. Decision systems and nutrition tools (including commercial products, services, and recent research outputs) will be assembled by national experts across Europe, including leading farmers, into a common online NUTRI-CHECK NET platform.
Check the project website: https://nutri-checknet.eu

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